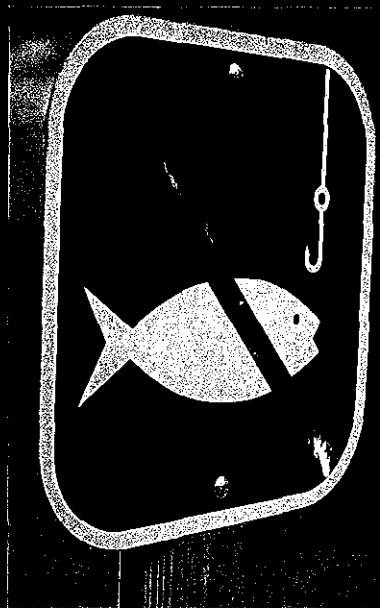
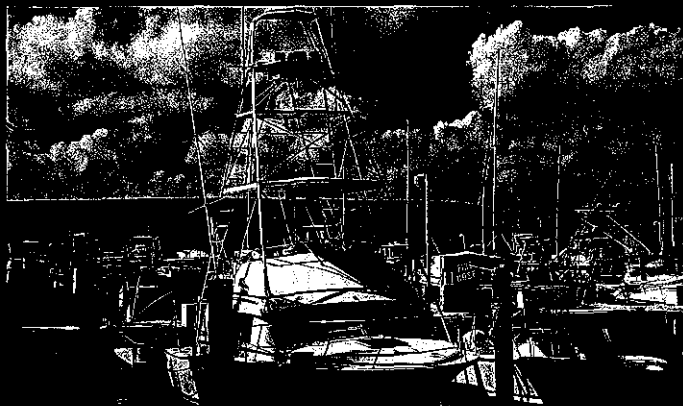


FINAL

Biscayne National Park

FISHERY MANAGEMENT PLAN SOCIOECONOMIC REPORT



prepared for:
U.S. National Park Service
Biscayne National Park
9700 SW 328 Street
Homestead, FL 33033-5634

EDAW

prepared by:
EDAW, Inc.
1420 Kettner Boulevard
Suite 620
San Diego, California 92101

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June 2005

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EXECUTIVE SUMMARY

This report, the Biscayne National Park Fishery Management Plan Socioeconomic Report, is designed to support the Environmental Impact Statement (EIS) that is accompanying the preparation of a new Fishery Management Plan (FMP) for the park. It is comprised of several sections, including the main affected environment and environmental consequences of the EIS alternatives sections, as well as supporting sections to address other EIS requirements, including a treatment of environmental justice.

The affected environment section characterizes the social and economic characteristics of the communities adjacent to Biscayne National Park and the nearby region to provide a background for the social and economic characterization of park-related fisheries activities. The economic dimensions of park-related activities in general are contrasted with the local economic context, including the larger economy of Miami-Dade County. In addition to a general socioeconomic characterization, detailed information on fisheries activity within Biscayne National Park is presented, to provide additional perspective. This detailed fisheries information includes characterizations of both commercial and recreational fishing activities derived from existing data sources and new information gathered specifically for this project, including data developed during ethnographic interviews with a limited number of fishery participants. In general, the economic scale of commercial fisheries activities that occur within Biscayne National Park is modest compared to the larger local economy. These activities, however, are important to the participants in a number of ways and may be seen as one part of the overall set of relationships to local resources that serve to define the social and cultural context of life in southeast Florida for some communities and populations. Baseline demographic and economic information relevant to subsequent environmental justice analysis is also presented in this section.

The environmental consequences section presents information on likely socioeconomic consequences of each of the alternatives contained within the EIS. These impacts are examined on a sector basis, with the sectors including the commercial fishing sector, the recreational fishing sector, and the support services sector. Community and regional impacts are also described, as are cumulative impacts. In general, no significant socioeconomic impacts are likely under Alternative 1 (no change) or Alternative 2 (minor change from current management). Potential impacts under Alternative 3 (moderate change from current management) and Alternative 4 (considerable change from current management) are more complex. No impacts significant at the regional level are expected under either alternative, but impacts at the sector or localized level are more difficult to predict. This is because management

objectives under these two alternatives may be achieved at least in part through management measures that are not yet specified. For example, area closures may be used but the specific areas to be closed are unknown. As different fisheries take place in different areas of the park, specific short- or medium-term consequences to individual fisheries cannot therefore be estimated at present. Under Alternatives 3 and 4, there is the potential for significant impacts on an individual operation, fishery sector, or localized level in the communities that are home to the fishermen, vessels, or related support service activities. Alternative 4, however, would have more significant impacts over the longer term as commercial fishing activities are expected to decline over time and eventually cease due to the nontransferable nature of the permits that would be used under the Alternative 4 management approach. Additional impacts would be felt with the prohibition of spear fishing (Alternative 4) and elimination of the recreational lobster sport season (Alternatives 3 and 4).

Environmental justice-related concerns may be triggered by specific area closures that are yet to be defined under the EIS alternatives. For example, shoreline fishers are characterized as more likely to be drawn from minority populations or low-income populations and are more likely to retain their catch for subsistence purposes than their counterparts in the nearshore- or offshore-guided sport fishery. If closure areas affected shoreline fishers but not fishers with more mobility to utilize resources elsewhere in the park, this could create disproportionate impacts.

AFFECTED ENVIRONMENT

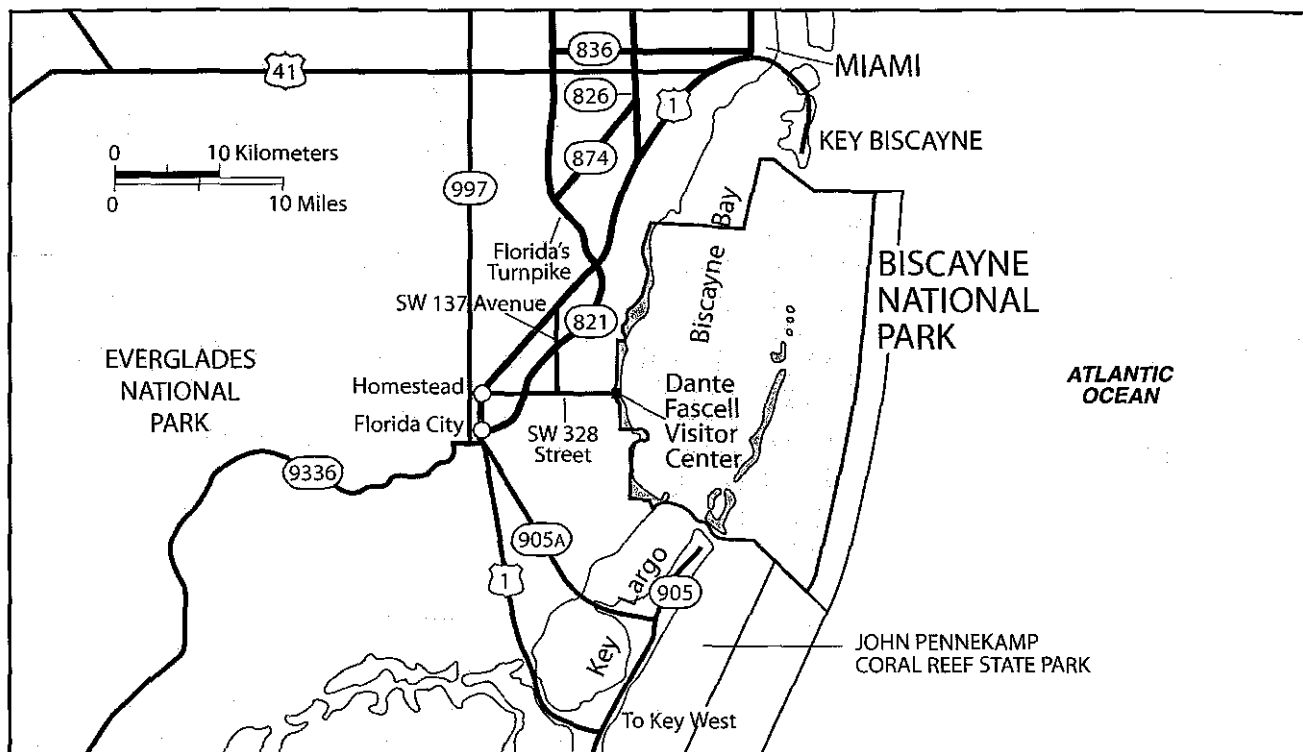
INTRODUCTION

This report examines the social and economic characteristics of the communities adjacent to Biscayne National Park and the nearby region. The economic interaction of park uses with the surrounding area, primarily Biscayne Bay and surrounding offshore waters, but also the larger economy of Miami-Dade County, is examined. In addition to a general socioeconomic characterization, detailed information on fisheries activity within Biscayne National Park is presented, along with information on the role of that fishery activity in the larger socioeconomic context.

As shown in Figure 1, Biscayne National Park is partially located within Biscayne Bay and extends into offshore waters east of the keys. Given the nature of the activities, both recreational and commercial, occurring within the park, bay, and offshore area, it was determined that the vast majority of direct economic and social ramifications leading from these activities, is felt within the Miami-Dade County economy. Therefore, for the purpose of this analysis, the socioeconomic study area is defined as Miami-Dade County.

Monroe County to the south of Miami-Dade County has a large tourism- and recreation-based economy. The geography of Monroe County and the nature of the tourist and recreation activities within that county allow for little overlap or interaction with Biscayne Bay or Miami-Dade County. Card Sound, an area in the extreme south of Miami-Dade County, is also partially within Monroe County and has some potentially important bay and park-related implications, as does the Ocean Reef resort and residential development in Monroe County on north Key Largo. However, it was felt that extending the parameters of the study area to incorporate these small areas would serve only to skew the results of the analysis.

Similarly, Broward County, located immediately to the north of Miami-Dade County, also has some direct economic implications to the park and the bay, namely, through limited numbers of recreational vessels traveling south to the vicinity of the bay. Again, it was reasoned that the minor economic nature of these activities does not warrant an extension of the study area to include Broward County.



Source: NPS



Figure 1
Park Boundaries

DEMOGRAPHICS

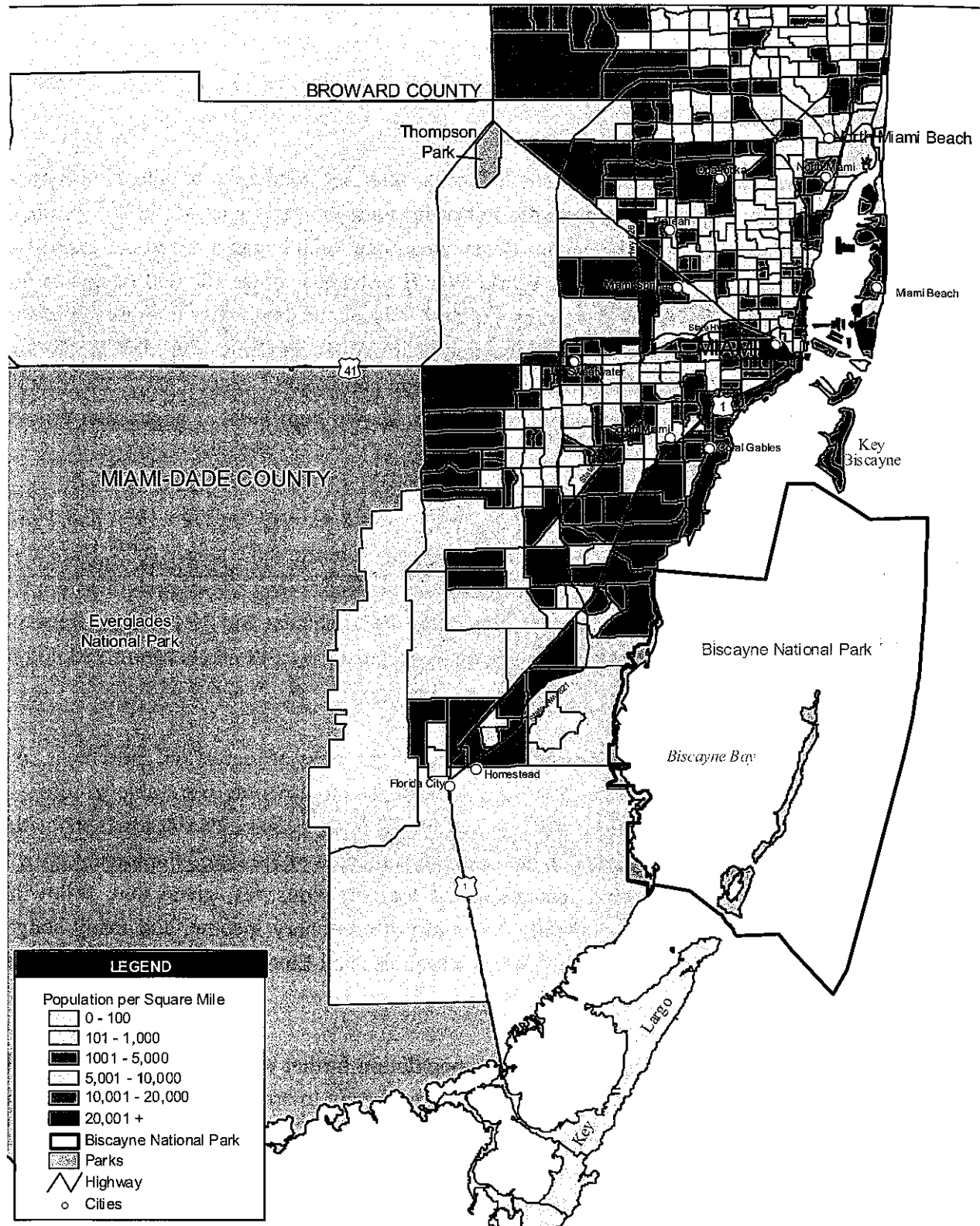
Population and Growth

Historically, the natural environment in south Florida was not conducive to intensive human habitation. Significant population growth did not occur until the early part of the 20th century. Extensive dredging and filling in the Miami Beach area circa 1920 began a decade of explosive growth in the Miami area (Michel 1976). World War II brought another 100,000 people to the greater Miami area when the Army Air Corps and the Navy established major training centers in the region. Many of these servicemen made the area their permanent home after the war. By the end of the 1950s, South Florida had doubled its pre-war population. Since then, both Miami-Dade County and the state of Florida have consistently shown high rates of population growth (Figure 2).

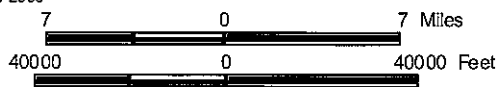
The resident population of Miami-Dade County grew by 88.8 percent between 1950 and 1960, marginally higher than the state growth rate of 78.6 percent over the same period (U.S. Bureau of the Census 2000). As shown in Table 1, over the following decades the rate of growth within the county roughly mirrored that of the state, ranging between 16 percent and 35 percent. Between 1960 and 2000, the population of Miami-Dade County increased by 140 percent from 935,000 to 2.25 million persons.

The primary reasons behind this consistent growth lay in the areas of recreation, retirement, and immigration. National prosperity after World War II meant more people were able to retire in Florida, creating jobs in construction and services for younger people. The destination of the majority of new residents has always been the southern peninsula of the state. Population growth was also stimulated by the growing recreation and tourism industries, given that, following World War II, American families generally had more discretionary income, and many sought recreational opportunities within Florida (Florida Resources and Environmental Analysis Center 1995).

During the latter half of the century, the county's population further expanded due to high levels of immigration. From the 1960s onward Cuban refugees began to arrive in significant numbers, but much immigration has occurred from many areas of Latin America and the Caribbean, such as the case with Haiti in the 1990s. During this time much of the population growth in the county and the state was attributable to immigration. From 1980 to 1990, net migration to Miami-Dade County accounted for 66 percent of the population increase compared to 87 percent



Sources: Census 2000



Scale: 1" = 40,000' (1:480,000)

Figure 2
Population per Square Mile

Table 1. Population of Miami-Dade County and Florida 1960-2000

	Miami-Dade County	Change from previous decade	Florida	Change from previous decade
1960	935,047	88.8%	4,951,560	78.6%
1970	1,267,792	35.5%	6,789,443	37.2%
1980	1,625,781	28.1%	9,746,324	43.5%
1990	1,937,094	19.1%	12,937,926	32.7%
2000	2,253,362	16.3%	15,982,378	23.5%
Projected				
2010	2,551,000	13.2%	18,866,000	18.0%
2020	2,958,000	15.9%	19,634,000	4.1%

Source: U.S. Bureau of the Census 1960-2000.

of the population increase for the state of Florida (Bureau of Economic and Business Research 2001). From 1990 to 2000, these figures changed to 55.9 percent for Miami-Dade County and 85.3 percent for the state of Florida.

As of 2000, Miami-Dade County, with a population of 2.25 million, was the most populous county in Florida and constituted 14.1 percent of the population of the state. The county had grown a further 16.3 percent as of 2000 (U.S. Bureau of the Census). Between 1990 and 2000, the U.S. population increased 13.1 percent while Florida's population increased 23.5 percent to a total of 16.0 million persons (U.S. Bureau of the Census).

Race, Ethnicity, Age, and Distribution

Race and Ethnicity

Miami-Dade County has significant populations of many ethnic and minority groups present, largely as a result of immigration trends over the last half century. While many groups are represented, the largest, by far, is Hispanic.¹ Miami-Dade County has the highest percentage (57 percent in 2000) of Hispanic population of any large county in the nation (Figure 3).

¹ The U.S. Bureau of the Census did not separately designate persons of Hispanic heritage in 1960. The number provided to the Research Section, Miami-Dade County Department of Planning and Zoning, provides an estimate. In the 1970 Census the identifying characteristics were the Spanish language, while in the 1980 Census a self-identification method was used. Thus, the Hispanic figures are not strictly comparable over the three decades.

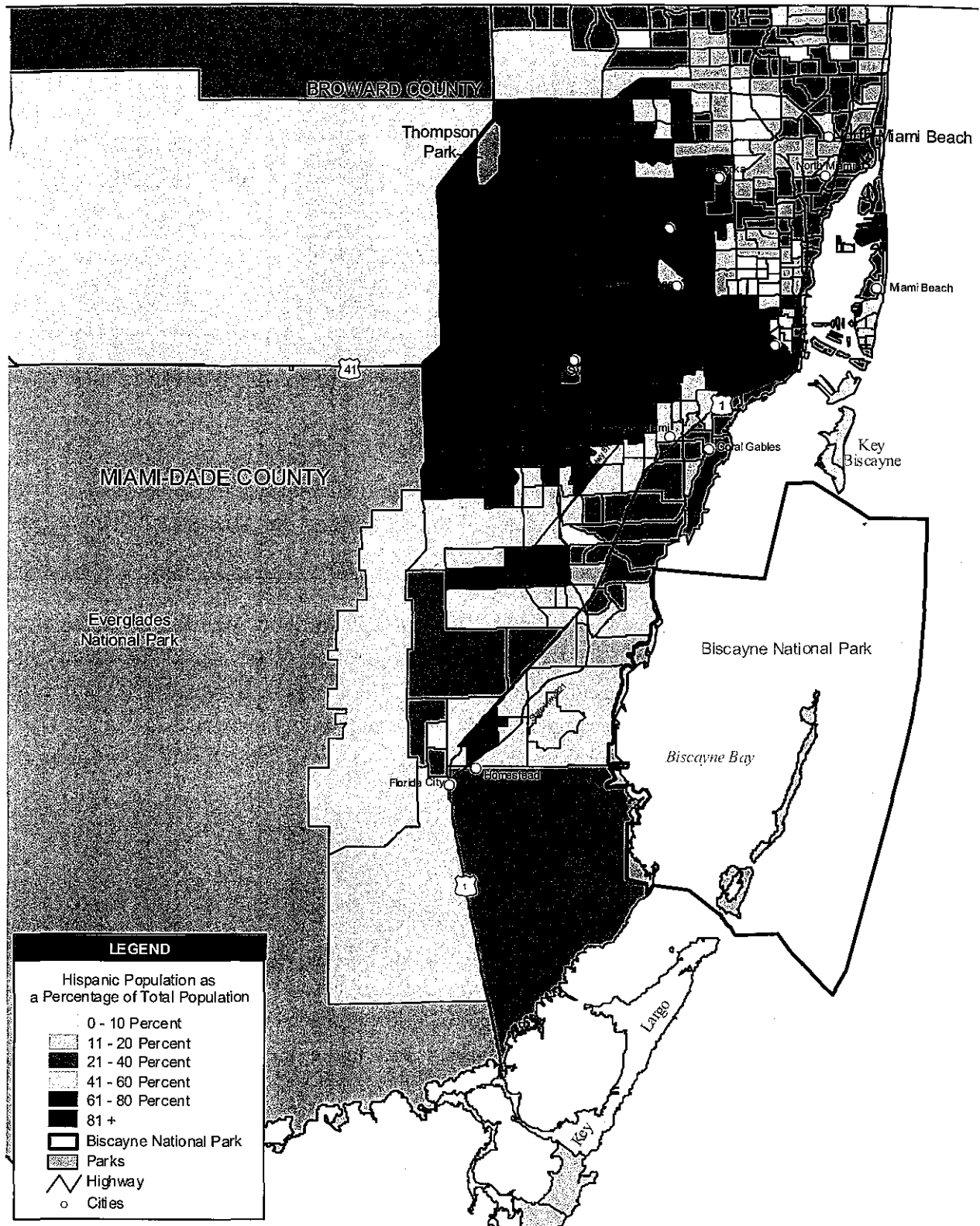


Figure 3
Hispanic Population as a
Percentage of Total Population

During the 30-year period between 1960 and 1990, Florida's population more than doubled in size, and although the state's non-Hispanic White and Black populations almost doubled, the Hispanic population grew over 16 times to comprise 12 percent of Florida's population as of 1990 (U.S. Bureau of the Census 1960, 1990).

Over the last 40 years Miami-Dade County's racial and ethnic composition has changed dramatically (Table 2). In 1960, 80 percent of the county's population was comprised of non-Hispanic Whites. By far the largest minority was Black/African Americans, accounting for 15 percent of the total population. Only 5 percent of the population was of Hispanic origin. By 2000, non-Hispanic Whites comprised less than 24 percent of the population, and much of the urbanized area had over 50 percent minority populations (Figure 4).

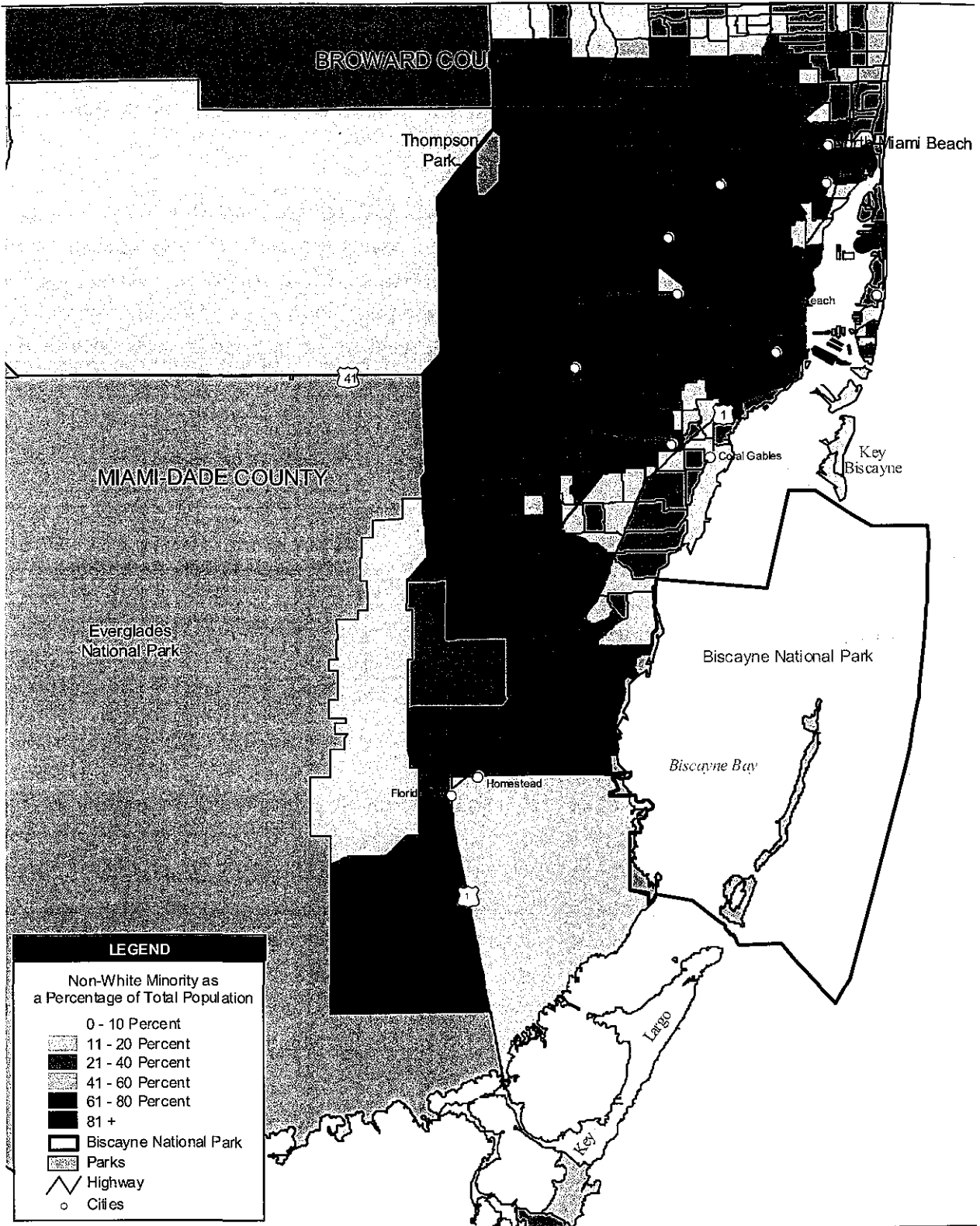
Table 2. Race and Ethnicity, Miami-Dade County 1960-2000

	White & Other Non-Hispanic Percent (Number)	Hispanic Percent (Number)	Black Non-Hispanic Percent (Number)	Total Number
1960	80.1% (747,748)	5.3% (50,000)	14.7% (137,299)	935,047
1970	61.7% (782,358)	23.6% (299,065)	14.7% (186,369)	1,267,792
1980	47.6% (773,038)	35.7% (580,994)	16.7% (271,749)	1,625,781
1990	31.7% (614,066)	49.3% (953,407)	19.1% (369,621)	1,937,094
2000	23.7% (534,485)	57.3% (1,291,737)	19.0% (427,140)	2,253,362

Source: U.S. Bureau of the Census 1960, 1970, 1980, 1990, 2000.

As shown in Table 2, in Miami-Dade County the Non-Hispanic White proportion of the population has been falling since 1960 (from 80.1 percent to 23.7 percent as of 2000). Conversely, the Hispanic population increased (from 5.3 percent to 57.3 percent as of 2000). The growth rate of Black/African American populations was much lower between 1960 and 1980, and since then has proportionally stayed basically constant. It is worth noting, however, that Black/African-American populations have significantly increased within specific areas of the county. For example, North Miami now has a Black/African American majority, rising from 32 percent in 1990 to at least 55 percent in 2000 (Miami-Herald March 28, 2001).

Miami-Dade County has the highest Hispanic population, both numerically and proportionally, within any of the 15 largest counties or incorporated areas of Florida (U.S. Bureau of the Census 2000). While the extent of the Hispanic population is evident throughout the county, 2000 U.S. Bureau of the Census data indicate a pattern of higher Hispanic populations in the county located



Sources: Florida Fish & Wildlife Conservation Commission, Biscayne National Park



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Scale: 1" = 40,000' (1:480,000)

Figure 4
Non-White Minority as a Percentage of Total Population

generally to the north and west of Miami (Figure 3). Communities with especially high Hispanic populations include Hialeah (90.3 percent), Hialeah Gardens (89.8 percent), Sweetwater (93.2 percent), and West Miami (84.0 percent).

As of 2000, Hispanic or Latino persons constituted the most populous ethnic group in Miami-Dade County. The county also contained the largest proportion of Hispanic or Latino populations within any of the 15 most populous counties in the state of Florida (U.S. Bureau of the Census 2000). Although Cubans have traditionally dominated the Hispanic population in the county, 2000 U.S. Bureau of the Census data indicated that significant changes had occurred.

While Cubans remained by far the largest Hispanic population component, with 650,000 persons living in Miami-Dade County, population components of other Latin American nations had shown significant population increases. For example, since 1990, immigrants from Paraguay increased 161 percent, those from Venezuela increased by 119 percent, and those from Mexico increased by 65 percent. The Cuban population grew proportionally less such that the number of non-Cuban Hispanics is now approximately equal to those with Cuban ancestry.

Age

Results of the 2000 U.S. Bureau of the Census indicate that the percentage of retirement-age adults is decreasing in Miami-Dade County (13.3 percent compared to 13.9 percent in 1990). Conversely, the proportion of the population under 18 years is rising (27.5 percent up from 24.1 percent in 1990). There has also been a consequential drop in the median age, countywide. In 2000, Florida as a whole had a higher proportion of retirement-age adults (17.6 percent), lower under-18 population (24.8 percent), and higher median age (38.7 years) than Miami-Dade County.

The above statistics, when coupled with other demographic data, depict dynamic changes in Miami-Dade County. Miami-Dade County has the lowest median age among the surrounding counties and is lower than the state (U.S. Bureau of the Census 2000). This demographic change has been acutely felt within many of the coastal retirement communities of south Florida, with the median age dropping and the number of resident families with children sharply rising over the previous decade (Beacon Council 2001).

Distribution

As shown in Figure 2, to date, most of the population is concentrated in northern Miami-Dade County, in and around the city of Miami. Outlying communities to the west and south of the county such as Florida City and Homestead were traditionally less densely populated. However, between 1990 and 2000 virtually the entire county experienced some level of growth, and many of the major metropolitan areas of Miami to the north (specifically Hialeah, Doral, Richmond West, and Country Walk) exhibited substantial levels of population expansion. Unincorporated areas of the county to the west of Biscayne National Park also experienced significant population growth. Future population forecasts continue to project more growth and development within southern Miami-Dade County (Department of the Air Force 1999).

In 1992, the effects of Hurricane Andrew caused a temporary but relatively significant change in the population distribution in southern Miami-Dade County. Prior to Hurricane Andrew, the population of the county was dispersed approximately 20.7 percent in the south and 79.3 percent in the north. By 1993 this distribution pattern had changed to 16.1 percent in the south compared to 83.9 percent in the north, although by 1995, the distribution, at 18.5 percent in the south, had partially reverted to pre-Hurricane Andrew levels (Smith 1996).

The projected population trend for Florida, and Miami-Dade County in particular, is continued significant population growth. By 2005, Miami-Dade County is projected to grow by 6.9 percent to 2.36 million persons and then by a further 6.6 percent by 2010 to 2.55 million persons. The rate of growth is expected to remain relatively constant at this level, with the population reaching 2.86 million by 2020. This projection would mark a total growth rate of 26.8 percent between 2000 and 2020. Population projections show Florida's population growing by 36 percent between 2000 and 2020 (to 21.79 million) (Office of Economic and Demographic Research 2002). With regard to race and ethnicity within the county, the Non-Hispanic White population is projected to fall to 16.4 percent by 2010 and 12.1 percent by 2020. Conversely, the Hispanic population is projected to rise to 63.5 percent in 2010 and 69.0 in 2020 (U.S. Bureau of the Census 2000).

LAND USES AND JURISDICTIONS

Biscayne National Park is located in Miami-Dade County and lies within and adjacent to an unincorporated area of the county. Only 5 percent of the 173,000 acres of Biscayne National Park is located on dry land. The majority of park area is in the waters of Biscayne Bay. To the north is the city of Coral Gables, which fronts on the bay, the city of Miami, and Key Biscayne

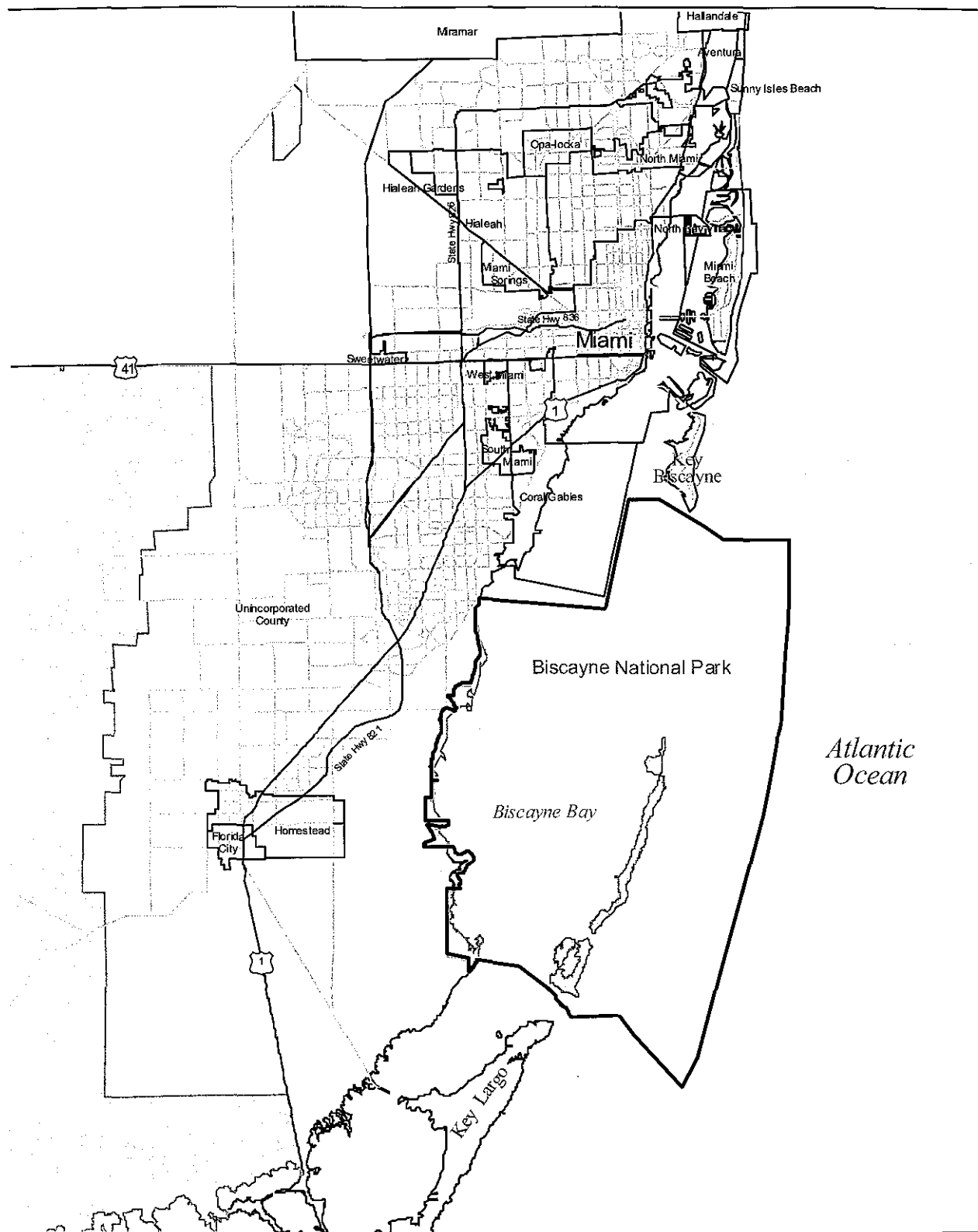
Village on Key Biscayne. The cities of Homestead and Florida City lie to the west of the park's Visitor Center (Figure 5).

Most of the developed area in Miami-Dade County is located on the Atlantic Coastal Ridge, which offers a stable foundation and sufficient elevation to avoid storm-surge flooding. Residential communities and commercial establishments, with pockets of industrial use, scattered neighborhood parks, and public facilities, dominate development within this area, which extends from the Broward County line southwesterly to Florida City.

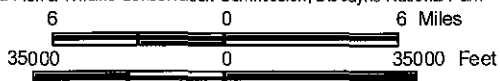
Miami-Dade County has delineated a boundary that defines the limits of allowable urban growth in the county. The Urban Development Boundary (UDB) (Figure 6 shows the UDB near Biscayne Bay) identifies those areas where urban development is permitted through the year 2005. The UDB extends from the northern county boundary with Broward County southwest to Florida City. Development within the boundary is generally approved, provided that the level-of-service standards for public facilities will be met. Public expenditures for urban infrastructure and services are focused on areas within the UDB and discouraged in areas outside of the UDB.

Generally, growth in the county is accommodated by increasing development densities and intensities within the UDB, or by expanding the UDB. Miami-Dade County has delineated an Urban Expansion Area (UEA), which encompasses areas where current projections indicate that further urban development beyond the year 2005 UDB is likely to be warranted some time between 2005 and 2015. Two UEAs are indicated near the former Homestead Air Force Base (HAFB).

Much of the land outside of the UDB is in agricultural production, particularly the area to the west, or is an environmental protection area (high-quality marshes, swamps, and uplands, and wet prairies) or environmentally protected park. Approximately 61 percent of Miami-Dade County lands lies in protected areas, including federal, state, and local parks; preserves; water conservation areas; and recreation areas (Figure 7). There are also areas of undeveloped open land including some between the former HAFB and Biscayne Bay. About 8 percent of the Miami-Dade County land surface is currently in agricultural use (Florida Agricultural Market Research Center 2002), and agricultural use in the southern portion of the county accounts for approximately 18 percent of the land use (excluding national park land). With a few exceptions, urban development is not allowed in areas that are designated for agricultural use. Agricultural products include traditional and tropical vegetables, tree crops, and commercial ornamental

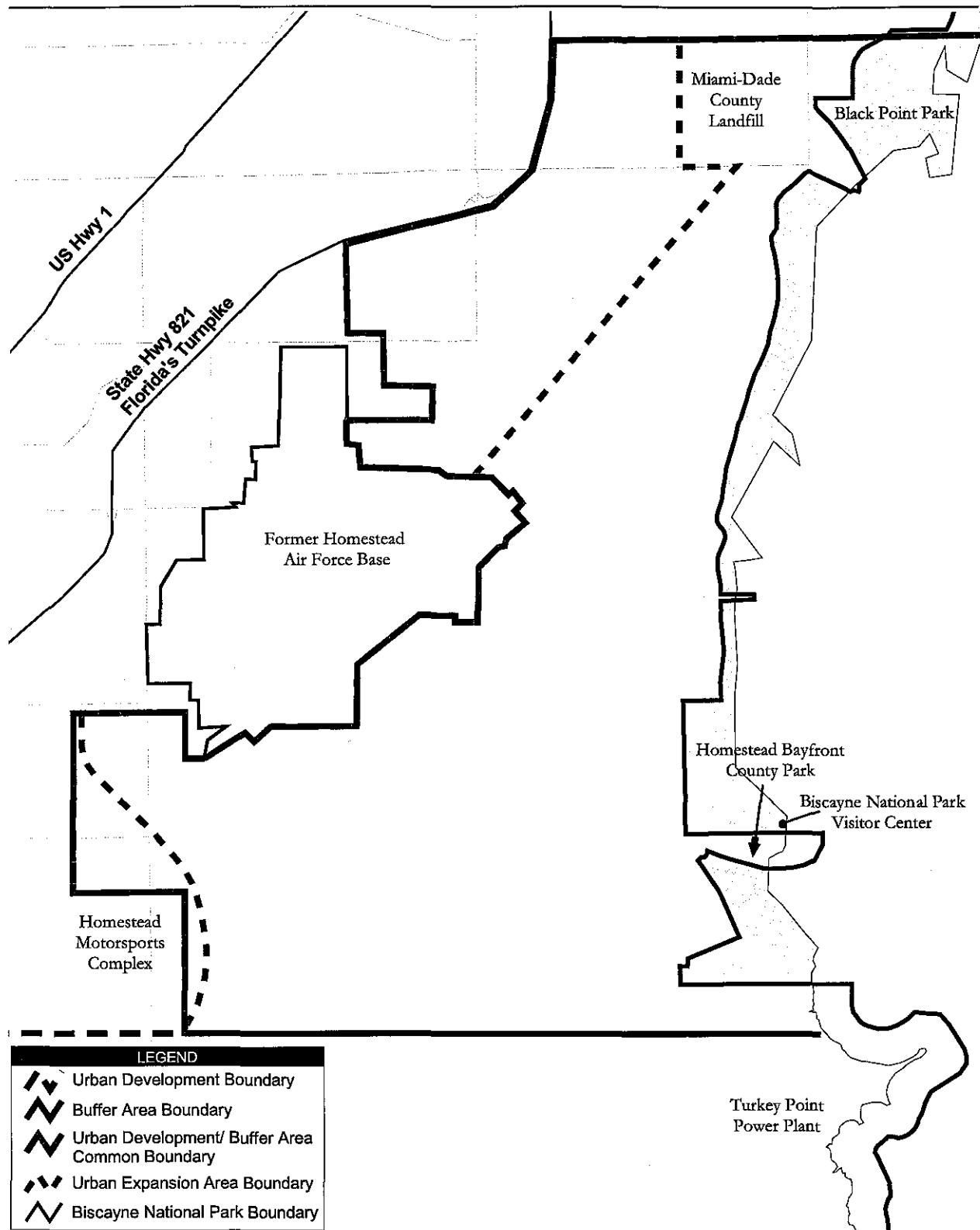


Sources: Florida Fish & Wildlife Conservation Commission, Biscayne National Park



Scale: 1" = 35,000' (1:420,000)

Figure 5
Jurisdictions near
Biscayne National Park



Sources: Florida Fish & Wildlife Conservation Commission, Biscayne National Park

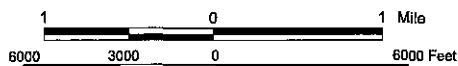


Figure 6
Homestead - Biscayne
Buffer Area

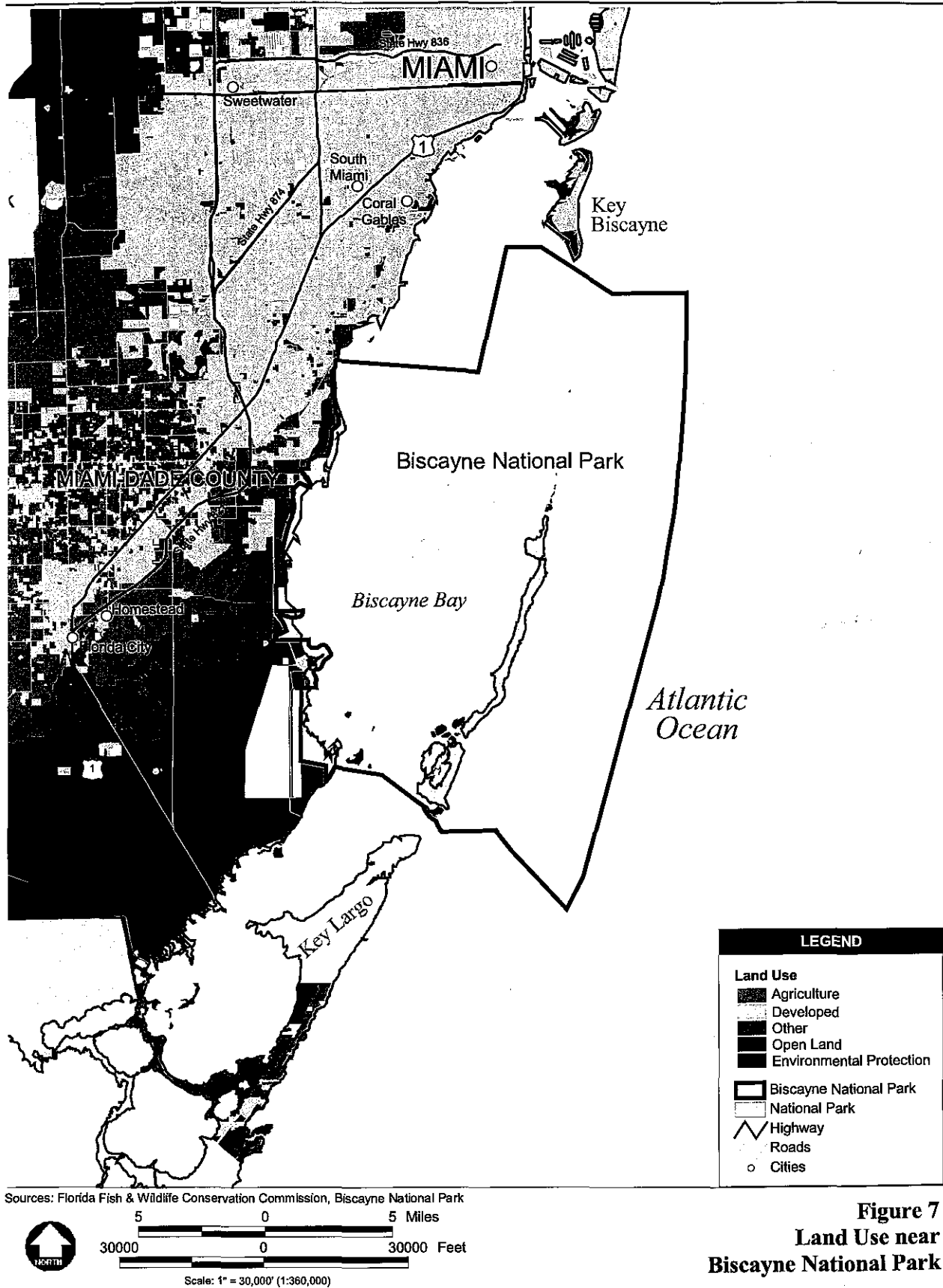


Figure 7
Land Use near
Biscayne National Park

horticulture. More tropical vegetables are grown in Miami-Dade County than in any other county in the United States. The area around the city of Homestead is used intensively for commercial agricultural purposes.

Hurricane Andrew, which struck Florida in August 1992, was responsible for extensive local crop loss, particularly grove crops (lime, mango, and avocado) and ornamental plant nurseries. Subsequent major storms (Hurricane Gordon, Hurricane Irene, and an unnamed storm) have resulted in substantial additional agricultural losses. Overall, the acreage devoted to agriculture has not changed significantly since Hurricane Andrew, and it remains the primary land use of south Miami-Dade County.

To ensure that the southern portion of the bay is not further degraded and will retain opportunities to restore more natural conditions in Biscayne National Park, a buffer area has been identified between the urbanized areas of southeast Miami-Dade County and Biscayne National Park. Much of the land in the 15,000-acre buffer area is undeveloped; however, there are scattered residences, agricultural fields and nurseries (Figure 8), and mineral extraction operations within the area. Land use designations of the Miami-Dade Comprehensive Master Plan for the buffer area include 6,400 acres of agricultural land, 4,000 acres of open lands, and 4,000 acres of environmental protection lands. Residential development is allowed at a density of one dwelling unit per 5 acres.

Several county parks are located on Biscayne Bay. Homestead Bayfront County Park is located just to the south of the Biscayne National Park Visitor Center. The park has a beach, picnic facilities, and a marina. Farther to the north is Black Point Park, with picnic facilities, and Black Point Marina (Figure 9). The Biscayne Bay Aquatic Preserve is a subtropical lagoon that runs along the southern coast of Florida and has average depths ranging from 6 to 10 feet, except in deeper dredged areas and main channels. The two distinct areas of the preserve are separated by Biscayne National Park; the northern portion extends north to Miami Beach between the mainland and Key Biscayne, and the southern portion consists of Card Sound. The preserve has a diversity of recreational and commercial in-water activities including private boating, sculling, water skiing, jet skiing, hang gliding, swimming, windsurfing, snorkeling, diving, and fishing. The northern portion of the preserve hosts the Port of Miami, one of the busiest cargo and passenger ports in the world.

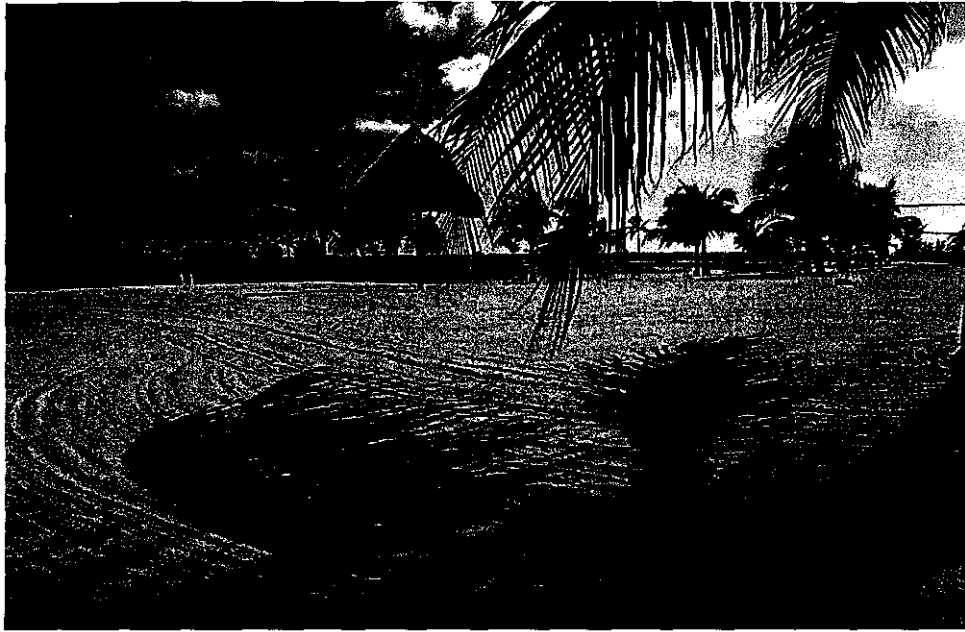


Agricultural fields adjacent to canal, with the former Homestead Air Force Base control tower in background



Nursery adjacent to canal

**Figure 8
Photographs of Agricultural Fields
and Nursery in Buffer Area**



Homestead Bayfront County Park beach area



Black Point Park and Marina with the Miami-Dade County Landfill in background

Figure 9
Photographs of County Parks

Two significant public service facilities are located adjacent to Biscayne National Park: Turkey Point Nuclear Power Plant (Figure 10) and Miami-Dade County Landfill (Figure 9). Turkey Point Nuclear Power Plant is located adjacent to the southwest boundary of Biscayne National Park. The plant, which includes two nuclear units, is owned and operated by Florida Power & Light. The plant has two tall stacks and numerous other massive structures. The Miami-Dade County Landfill is a highly visible land use due to its relative height and mass. The mound, created from solid waste materials, is the highest landform in the area. The landfill is located adjacent to Black Point Park, just outside of the UDB and UEA.

The former HAFB, located east of Homestead in an unincorporated portion of the county within the UDB, encompasses a relatively large area with future development potential. The Air Force Reserve Command is currently using a portion of the base, and the airstrip accommodates aircraft associated with events at the Homestead Motorsports Complex (discussed below). Originally, the Proposed Action for base reuse was the transfer of 1,632 acres of surplus property, including the airfield, to Miami-Dade County for the development of a one-runway commercial airport. Other alternatives included a commercial spaceport, and nonaviation mixed use. A Record of Decision on the Final Environmental Impact Statement was issued on October 26, 1994. A Supplemental Environmental Impact Statement was prepared by the U.S. Air Force and the Federal Aviation Administration when it was determined that the action warranted further review. A Supplemental Record of Decision for that document was issued on February 20, 1998. Subsequently, another Supplemental Environmental Impact Statement was prepared that revisited previous decisions and addressed additional matters. A Second Supplemental Record of Decision was issued on January 15, 2001 (Department of the Air Force 2001). The Second Supplemental Record of Decision concluded that the surplus property should not be conveyed for airport purposes. Instead, it recommended that the U.S. Air Force retain the existing runway and taxiways and the remaining surplus property (about 717 acres) be transferred to the county for mixed use development.

The Beacon Council, the county's economic development organization, hired a panel from the Urban Land Institute to study the site and with a consultant recommend a use for the 717 acres that the federal government has not targeted for other purposes. The panel prepared a Development Strategy (September 2001) for the reuse of the former base. The panel recommended short-term use of the base by institutional tenants (fire rescue, National Park Service [NPS] facilities for the Everglades Reclamation and Restoration Project, hospital, and vocational training center). A visitor and hospitality center called Destination Everglades was recommended on 30 acres off-site, either in downtown Homestead, at the south end of the



Turkey Point Nuclear Power Plant from vantage point of channel near Convey Point



Homestead Motorsports Complex

**Figure 10
Photographs of Turkey Point Nuclear Power Plant
and Homestead Motorsports Complex**

Florida Turnpike, or near the Everglades National Park or Biscayne National Park Visitor Centers. The land would be obtained by a land swap of 300 acres at the former HAFB. It was anticipated that Destination Everglades would result in an increase in the value of residential land in the area, consequently causing demand for urban levels of development at the former HAFB. Approximately 300 acres would be available for the development of 1,200 to 1,800 residential dwelling units. Neighborhood commercial and industrial would be included in the development. There has been no significant action on the panel's recommendations, and it is unlikely that development on the former HAFB will occur within the foreseeable future.

The land use east of the former HAFB and the UDB (from west to east) is agriculture, undeveloped open land, environmental protection, and Biscayne National Park. The vast majority of the land to the south of Florida City is classified Environmental Protection, with relatively small areas of agriculture and open lands near the city boundary. With the exception of Turkey Point Nuclear Power Plant, very little development has occurred in this area. The Biscayne Bay Shoreline Development Review Committee provides review of plans and applications for development action within the shoreline development review boundary. Several minor projects (telecommunications, rock and sand extraction) have been approved in the area. The committee denied an application for a natural gas-burning peaking plant on land abutting Biscayne National Park.

Five major and three minor east- and southeast-trending canal systems direct floodwaters into Biscayne Bay. They also maintain minimum water levels during drought events. The construction of the drainage and flood-control network in southeastern Florida began during the early 20th century for the purpose of managing the water resources of the area. This drainage canal network affected the hydrological pattern in southeastern Florida by replacing sheet flow with canal flow, thereby significantly reducing the altitude of the water table and diminishing groundwater flow to Biscayne Bay. The extensive canal network that cuts into the underlying unconfined aquifer has historically resulted in detrimental consequences: overdrainage, inland migration of coastal salt water, and intrusion of these saline waters to nearby municipal well fields. The construction of canals and pumping from the surficial aquifer for water supply in south Florida has resulted in the lowering of water levels in the aquifer. Consequently, the hydrodynamic balance between freshwater and saltwater in the groundwater flow system has changed, resulting in inland migration of saltwater into the freshwater aquifers. Coastal well fields used by many communities in south Florida are threatened, with some closed due to the inland movement of the saltwater.

Florida City, located at the southern terminus of Florida's Turnpike (Highway 874), is the southernmost incorporated city in Miami-Dade County. The city is the "gateway" to the Florida Everglades, the Florida Keys, and Biscayne National Park. The road to the Biscayne National Park headquarters and Visitor Center (SW 328th Street) extends directly east from the northern boundary of the city. Florida City is a relatively small (approximately 3 square miles), residential community with a variety of housing types and densities, a town center, support facilities, parks, and light industrial land uses. Over the last several years, Florida City "has done a lot of revitalization with new development" (Jackson 2004). Tourism-oriented and mixed commercial uses line a portion of the major transportation corridors: Florida's Turnpike and Highway 1. Little development has occurred in the area to the west of the city, which is primarily in agricultural use or vacant, though there is some single-family residential development. Development to the south is minimal, with mostly agriculture, nurseries, and scattered residential development.

The city of Homestead is located adjacent to Florida City on the northeast and encompasses more than 13 square miles. Homestead is bounded by an unincorporated area of Miami-Dade County on the west, north, east, and southeast. The city serves as the center of Miami-Dade County's agricultural industry and has residential, commercial, industrial, and institutional land uses scattered throughout the city. While most of the area in the western portion of Homestead is built out, the eastern portion of the city is largely undeveloped except for some residential developments; nurseries and agriculture; and two large sports complexes, the Homestead Motorsports Complex (Figure 10) and the Homestead Sports Complex. The Homestead Motorsports Complex was opened in 1995. The 344-acre facility hosts championship racing, including NASCAR series, on its 1.5-mile oval track and 2.21-mile road course. The complex can accommodate 60,000 people.

Immediately to the west of the Homestead Motorsports Complex is the Homestead Sports Complex, which has stadium seats for 6,500 fans and parking for more than 3,900 vehicles. The state-of-the-art complex has five practice baseball fields, a 114-room dormitory, an administrative office, and clubhouses for home and visiting teams. The stadium is largely unused, having been originally constructed as a spring training complex for the Cleveland Indians, who decided to go elsewhere after the stadium was rebuilt following Hurricane Andrew. The city of Homestead is currently (December 2002) trying to negotiate a deal with baseball and softball promoters.

The city of Coral Gables lies to the southwest of the city of Miami. A portion of the city fronts on Biscayne Bay. Coral Gables is highly urbanized, and much of the city, which is home to the

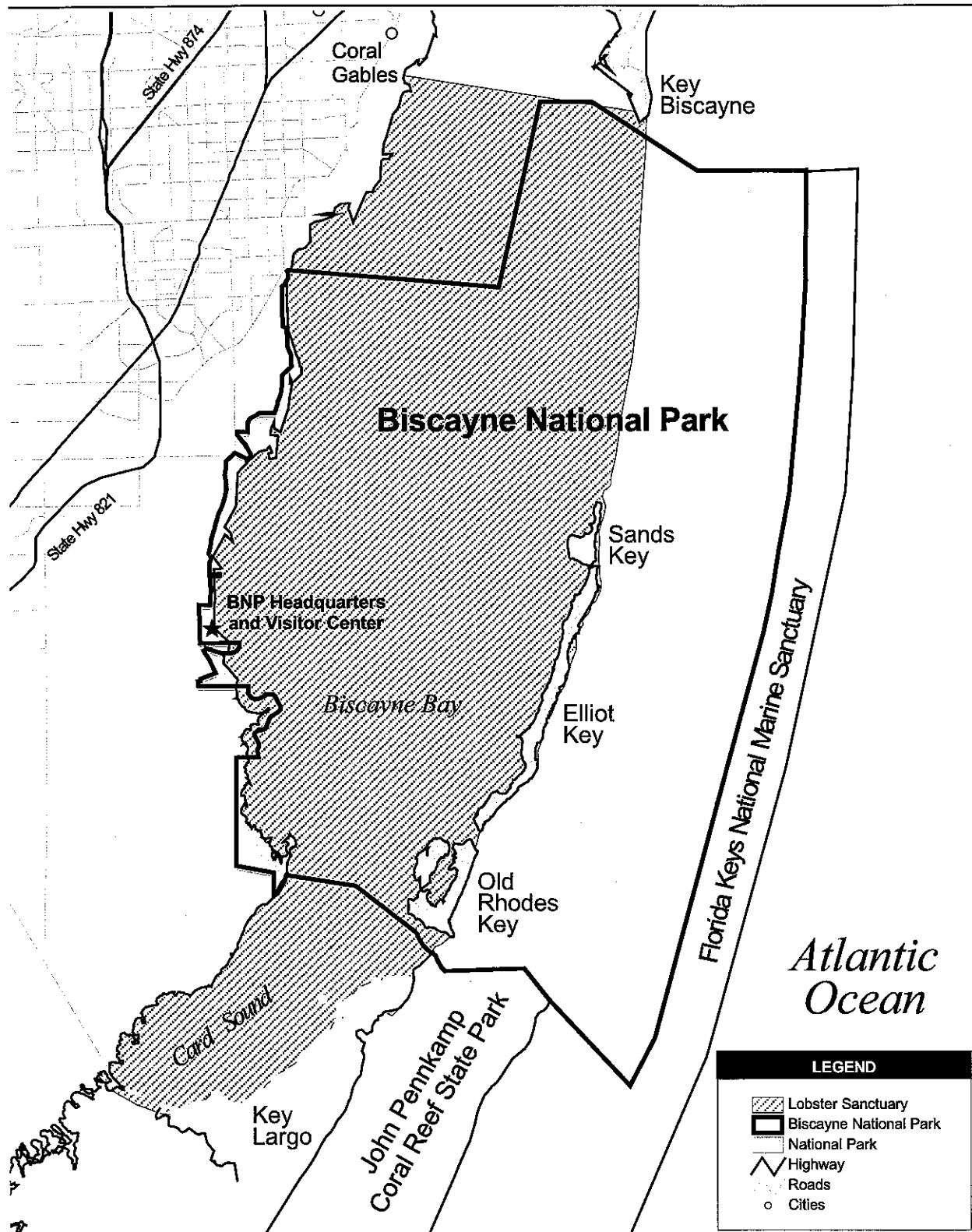
University of Miami, is covered with low-density residential development. The area along the coast includes single-family residences that line a series of canals. There is also Matheson Hammock Park, Florida State Preservation Area, and Chapman Field Park. Matheson Hammock Park Beach has a man-made island pool, which is flushed naturally with the tidal action of nearby Biscayne Bay, and a full-service marina. Future development potential in this area is very limited due to the current level of development and development restrictions on nature preserves.

Monroe County is located on the southwestern tip of the Florida peninsula and encompasses the western half of Everglades National Park; the southern portion of Big Cypress National Preserve; and 822 islands including Key Largo, the nearest inhabited island to Biscayne National Park, and Key West. The Florida Keys have a variety of land uses including protected habitat, residential, commercial, and recreational. Only 30 of the Florida Key islands are inhabited. The Monroe County boundary with Miami-Dade County runs between Key Largo and the southern keys of Biscayne National Park.

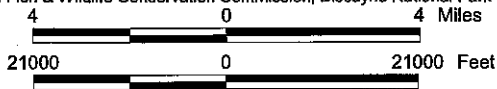
The Key Largo area includes the city of Key Largo, small residential communities, recreational facilities primarily associated with water sports, and restricted open space. The residential areas nearest Biscayne National Park are the Ocean Reef Club and Key Largo Angler's Club, which are situated on the northeastern point of Key Largo. Ocean Reef Club is an exclusive gated resort for residents and visitors. The resort includes privately owned residences, visitors' accommodations, golf courses, retail shops, marina, inn and conference center, a small grammar school, and private airstrip. To the south of the Ocean Reef Club is the Key Largo Angler's Club, a gated private fishing club that has a mix of residential units.

Crocodile Lake National Wildlife Refuge covers a significant portion of north Key Largo. The refuge, which covers about 6,600 acres near State Route 905 (Card Sound Road), is closed to general public use. The principal objectives of wildlife refuge are to provide habitat and protection for migratory birds and federally listed threatened and endangered species, and to protect the globally endangered tropical hardwood hammock plant community.

John Pennekamp Coral Reef State Park, the first undersea park in the United States, covers approximately 178 nautical square miles of coral reefs, seagrass beds, and mangrove swamps (Figure 11). It was established to protect and preserve a portion of the only living coral reef in the continental United States. The park, located off of Key Largo, is about 25 miles long and extends 3 miles into the Atlantic Ocean. The 2,800-square-nautical-mile Florida Keys National



Sources: Florida Fish & Wildlife Conservation Commission, Biscayne National Park



Scale: 1" = 21,000' (1:252,000)

Figure 11
Marine Sanctuaries and Parks
adjacent to Biscayne National Park

Marine Sanctuary surrounds the entire archipelago of the Florida Keys. The sanctuary lies about 6 miles seaward of the Keys and extends into Miami-Dade County, bordering Biscayne National Park on the east (Figure 11). The sanctuary was established to promote comprehensive management of special ecological, historical, recreational, and aesthetic resources.

LOCAL ECONOMY

Workforce and Employment Characteristics

Labor Force

As of 2001, slightly less than 1.1 million people made up Miami-Dade County's labor force, having increased 13.5 percent from 1990 (Table 3). Historically, employment within Miami-Dade County has been dominated by a number of major economic sectors including construction, agriculture, tourism, and trade. Over time, the regional economy has become more service oriented, with an increasing share of employment in service-producing industries and a decreasing share of employment in goods-producing industries.

Table 3. Miami-Dade County Labor Force

Year	Labor Force	Unemployment Rate
1980	817,377	8.1%
1990	952,318	6.7%
2000	1,053,924	5.3%
2001	1,080,432	6.9%

Source: Beacon Council 2002.

While the services sector has historically been a significant portion of the labor force, an important recent trend within the county has been the continued growth of more service-oriented industries such as banking, real estate, accounting, and retail. As shown in Table 4, in both 2000 and 2001 the service sector was the largest employer in Miami-Dade County followed by trade (predominantly retail) and government. Employment levels are expected to continue to increase, with growth shifting from the goods-producing sector as manufacturing declines due to international competition (Rust 1998).

Table 4. Miami-Dade County Annual Average Employment by Sector

Industry	1996	2000	2001	
	Employment	Employment	Employment	% of Total Employment
Non-agricultural Employment				
Construction	35,000	37,500	36,600	3.5%
Manufacturing	77,100	68,800	64,000	6.2%
Transportation/Public Utilities	80,100	92,400	95,600	9.3%
Trade	247,700	261,000	265,800	25.7%
Finance, Insurance, and Real Estate	66,400	66,600	67,300	6.5%
Service and Mining	299,400	346,800	354,100	34.3%
Government	132,100	143,000	149,200	14.4%
Total Non-agricultural Employment	937,800	1,016,100	1,032,600	100%

Source: Florida Agency for Workforce Innovation, 2001, Office of Workforce Information Services, Labor Market Statistics Annual Average Employment 1996-2000.

As shown in Table 5, major employers include the service industries (which partially includes tourism and visitor-serving sectors), retail and wholesale trade, and health care. Employment in manufacturing and goods-producing industries has historically provided significantly higher wages than those in service-oriented enterprises (Governor's Commission for a Sustainable South Florida 1995). For example, average annual salaries in south Florida for 1997 were approximately \$25,000 for jobs in the services sector, compared to approximately \$33,000 within the manufacturing sector, \$36,000 within the mining industry, and \$27,000 within the construction industry (Florida Department of Labor and Employment Security 1997). Since this recent job growth has tended to be concentrated in the comparatively low-paying services sector, it may explain the dichotomy between the relative levels of employment increases and the fall in incomes over the same time period within Miami-Dade County.

Seasonality of Employment

While tourism in Miami-Dade County, given its diverse international underpinnings is a year-round multibillion dollar industry, a traditional winter high-season remains fully evident. Typically the tourism "season" commences immediately following Thanksgiving and continues through April/May during a given year (Sitomer, personal communication 2003). During this time, employment levels within many of the visitor-serving industries (hotels, restaurants, bars, recreational attractions, etc.) increase to cater to the increased numbers of visitors and seasonal residents. Conversely, the economy, since tourism directly and indirectly plays such a vital role across many sectors, slows during the summer off-season, and employment falls. The continuing

**Table 5. Number of Employees, Establishments, and
Annual Payroll by Industry, Miami-Dade County**

Industry	Number of Employees March 1999	Annual Payroll (Million)	Number of Establishments
Construction	34,234	1,080	3,763
Manufacturing	58,699	1,584	2,846
Wholesale Trade	72,282	2,526	8,655
Retail Trade	113,667	2,251	9,622
Transportation with Housing	69,798	2,193	2,591
Finance & Insurance	44,184	2,192	3,733
Professional/Scientific	48,312	2,545	8,475
Admin/Support	98,235	2,212	3,661
Educational Services	21,951	673	576
Health Care	101,724	3,122	6,405
Accommodation/Food Svc.	77,530	1,064	3,736
Other Services	37,214	765	5,628
Arts, Entertainment, Recreation	9,156	251	679

Source: U.S. Department of Commerce Economics and Statistics Administration U.S. Bureau of the Census, County Business Patterns 1999, May 2001.

rise in tourism-oriented and service-based employment within the county at the expense of industries such as manufacturing means that the current seasonal fluctuations of employment are unlikely to decrease.

The agricultural and commercial fishing industries within the county also have employment seasonality mandated by nature and regulatory controls, respectively. For example, agricultural employment traditionally increases around citrus harvest time. Similarly, a proportion of commercial fishing employment and/or income is linked to the different season openings for species. For example, the stone crab season is closed from May 15 to October 15 during any given year (Florida Administrative Code [FAC] Chapter 68B-13).

Income

As shown in Table 6, as of 2000, Miami-Dade County had a per capita income² of \$18,497, 14.2 percent below the Florida average of \$21,557 and 14.3 percent below the national average. In comparison, as of 1990, the average per capita income within Miami-Dade County was

² Per capita income is the mean income computed for every man, woman, and child in a geographic area. It is derived by dividing the total income of all people 15 years old and over in a geographic area by the total population in that area. Note: Income is not collected for people under 15 years old even though those people are included in the denominator of per capita income. This measure is rounded to the nearest whole dollar.

approximately 6.8 percent below that of Florida (which in turn was only marginally above the national average of \$14,420) and 5.0 percent below the national average. In 2000, the per capita income within Miami-Dade County ranked in the top third of all Florida counties (U.S. Department of Commerce 2001). This figure showed little change from 1990, when the county ranked 21st out of the 66 counties in the state (U.S. Bureau of the Census 1990, 2000).

Table 6. Income Levels 1990-2000

Year	1990		2000		% Change 1990-2000	
	PCI	MHI	PCI	MHI	PCI	MHI
Miami-Dade	13,686	26,909	18,497	35,966	35.1	33.6
Florida	14,698	27,483	21,557	38,819	46.6	41.2
U.S.	14,420	30,056	21,587	41,994	49.7	39.7

Source: U.S. Bureau of the Census 1990, 2000.

PCI = Per Capita Income

MHI = Median Household Income

In 2000, the median household income³ in Miami-Dade County was \$35,966, which was 7.3 percent below Florida's median household income of \$38,819. In comparison, in 1990 the median household income within Miami-Dade County was approximately 2.0 percent below that of Florida (which in turn was 8.56 percent below the national average of \$30,056).

As shown above, during the last decade, both the per capita income and median household income listed for Florida, while numerically rising significantly (46.6 percent and 41.2 percent, respectively), marginally fell in relation to the national average. Over the same period, per capita and median household incomes in Miami-Dade County, both below the state average in 1990, fell further. Comparing Miami-Dade County with the national averages, as of 2000 per capita incomes were 16.7 percent below the national average, and median household incomes were 14.3 percent below the national average (Figure 12).

There are a number of underlying factors within the economy and the demographic makeup of the county that could contribute to the lower-than-average income levels described above. One factor is the significant proportion of the population below 24 years of age who, on average, earn

³ Median household income is the amount that divides the income size distribution of a specified group of households into two halves; i.e., the incomes of the first half of households are below the median, while those of the second half are above the median.

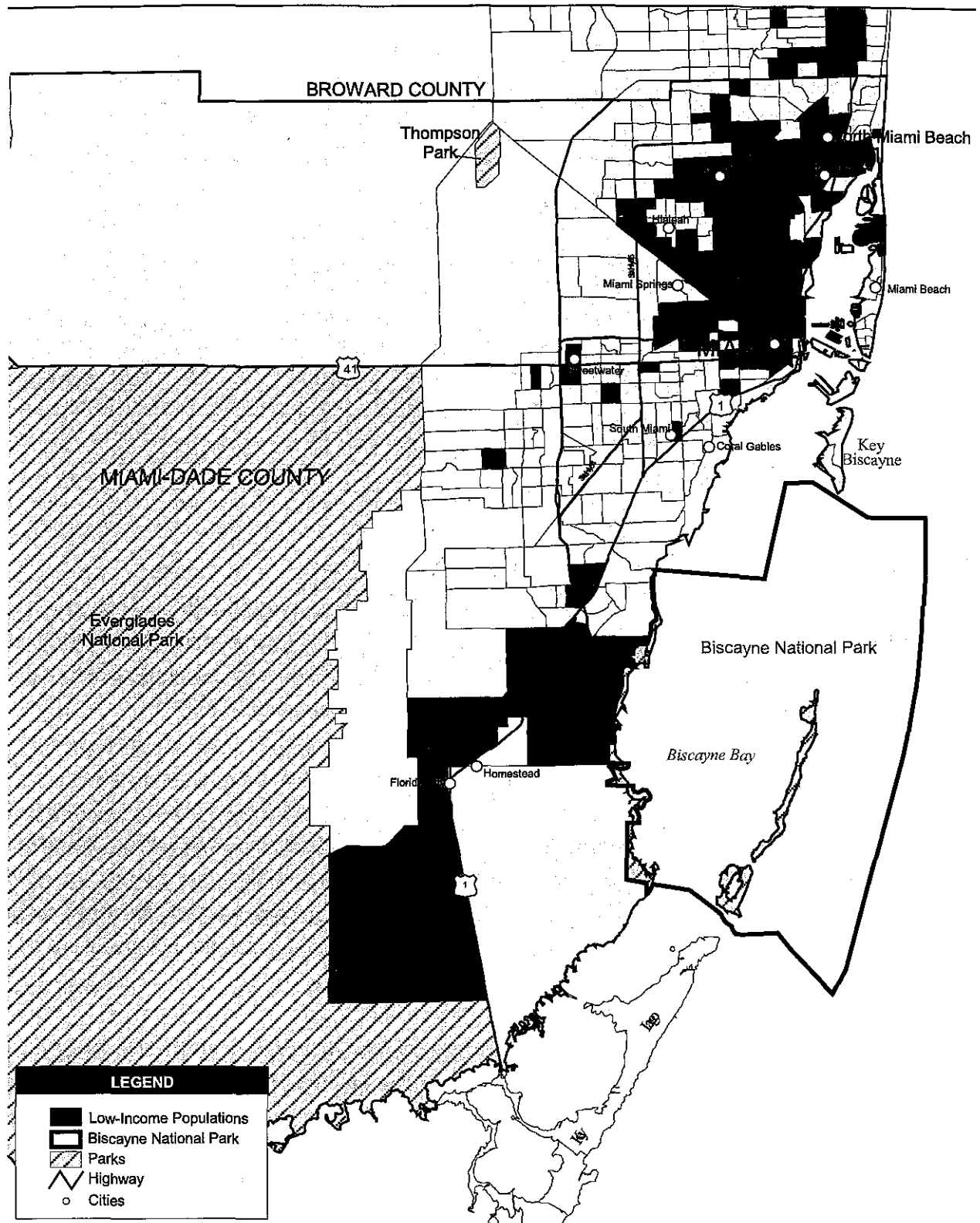


Figure 12
Low-Income Populations
by Census Tract

significantly less than older groups. Another factor is directly related to the prevalence and growth of lower-wage, service-sector jobs and the inability of the economy, in the face of a prolonged influx of immigration, to cope with the demands of a rapidly growing population.

Unemployment

As shown in Table 7, unemployment levels within Miami-Dade County, while to an extent mirroring the general decline in state and national unemployment levels during the last decade, have continuously ranked above both the state and national averages. The “spike” to 10.0 percent in 1992 was directly related to the countywide economic impacts of Hurricane Andrew.

Table 7. Local, State, and National Unemployment Levels, 1990-2001

Year	Miami-Dade County			Florida	U.S.
	Employment (Persons)	Unemployment (Persons)	Unemployment Rate	Unemployment Rate	Unemployment Rate
1990	888,469	63,849	6.7%	6.0%	5.6%
1991	878,603	83,486	8.7%	7.4%	6.8%
1992	878,028	97,996	10.0%	8.3%	7.5%
1993	941,103	78,734	7.7%	7.0%	6.9%
1994	956,198	82,988	8.0%	6.6%	6.1%
1995	954,304	69,494	6.8%	5.5%	5.6%
1996	954,589	75,134	7.3%	5.1%	5.4%
1997	961,665	74,244	7.1%	4.8%	4.9%
1998	975,918	67,004	6.4%	4.3%	4.5%
1999	984,468	60,550	5.8%	3.9%	4.2%
2000	998,309	55,615	5.3%	3.6%	4.0%
2001	1,005,810	74,622	6.9%	4.8%	4.8%

Source: Florida Department of Labor and Employment Security, Bureau of Labor Market Information, *Annual Averages Labor Force Summary, 1980-2000*; *Florida Research and Economic Database (FRED) Labor Force Employment and Employment 1980-2001*.

A significant factor leading to the heightened levels of unemployment in Miami-Dade County is the shortage of low-skilled jobs relative to the labor supply for these positions, including a large number of recent immigrants within the labor force. The historically high levels of immigration in south Florida, and Miami-Dade County in particular, have reached a saturation point regarding low-skilled employment. Compounding these factors, welfare rolls have shrunk due to specific government initiatives, and many previously unemployed residents are attempting to reenter the workforce (Rust 1998).

Two locally important economic sectors are still feeling impacts of the September 11, 2001, terrorist attacks: aviation and visitor industries. Because the service sector is the largest employer sector in the county, coupled with the downturn in the national economy, unemployment levels within the county were significantly impacted, rising to 8.4 percent in November 2001. However, marking the relative "recovery" made by the county economy, this rate had fallen to 7.5 percent as of June 2002 (Beacon Council 2002).

Miami-Dade County Economic Characterization

Table 8 summarizes the major sectors within the economy of Miami-Dade County. They include tourism, services, international/merchandise trade, retail trade, and agriculture.

Table 8. Overview of Miami-Dade County Economy

Major Economic Sector	Description	Revenue/Earnings	Number of Employees
Tourism	Destination since 1920s, significant international tourist volume. More than 10 million visitors annually. Overnight visitors contribute more than one-third of sales tax revenues annually and support industry-related expenditures through special taxes. September 2001 events had impacts throughout year, although countering the national trend, overall tourist figures rose (Beacon Council 2002).	\$13 billion (2000)	140,000 (2000) (approximately 14 percent of the total workforce) (Beacon Council 2002)
Services	Large, broad-sector doctors, dentists, laborers, and fast-food workers. Tourist-related establishments, such as hotels, theme parks, and other recreational activities, also figure highly within this sector. Most are relatively low-paying jobs compared with manufacturing industries. Employment in this sector is expected to continue to increase, further shifting from goods producing as manufacturing declines due to continued international competition (Rust 1998).	The services industry provided 32.7 percent of total earnings within county in 1999 (U.S. Department of Commerce 2001)	448,984 (1999); Rose 10.78 percent from 1996
Trade/International Commerce	Miami-Dade County is an international trading crossroad. Imports and exports are rising rapidly. Strongly positioned within global economy. Significant trade hub within global economy and "Gateway to Americas." Proximity to Latin America and the Caribbean has made the county a very important center of international trade.	\$56 billion import/export value in Miami Customs District (2000) (Beacon Council 2002)	Each additional 1 billion in trade generates approximately 1,000 jobs throughout region (MISER 1994)
Merchandise Trade	The Port of Miami is the number one cruise port in the world and also ranks as a top cargo port worldwide. Miami has more than 40 shipping lines connecting 362 ports in 132 countries worldwide. Total of 60 percent of Central American, 46 percent of Caribbean, and 27 percent of South American trade is	Port operating revenues of \$64.5 million (1999) (Beacon Council 2002) Port contributes	80,400 (2001), of which 45,000 jobs were supported by the Port (Port of Miami 2002)

Major Economic Sector	Description	Revenue/Earnings	Number of Employees
	processed through Miami (2000). Miami International Airport is ranked first in the U.S. international freight and sixth in the world. More than 1.8 million tons were shipped to and from the airport in 2000. Top imports include aircraft, apparel, computer components, and oil. Top exports include computers and computer components, telephones, and aircraft parts.	\$8 billion annually to economy (Port of Miami 2002)	
Retail trade	Food, general merchandise, eating and drinking establishments, automotive, furniture/appliances, apparel. 11,930 establishments within county (Florida Agency for Workforce Innovation 2001).	\$27 billion total; \$2.251 billion payroll (1999)	185,400 (2001)
Agriculture	Tropical fruits, citrus, container plants, corn, tomatoes. County lime groves constitute 21 percent of all tropical fruit acreage in the country. Most acreage is situated in south portion of the county. Long history within the county. Has been negatively impacted by NAFTA. Overall acreage falling due to competition, population growth, and development.	\$416.5 million (1997) (USDA); \$842 million economic impact; \$229,014 million earnings (U.S. Department of Commerce 2001)	23,000 (1996); 14,894 (1990)

The subtropical climate and range of attractions bring millions of visitors annually to the area, and tourism is one of the largest industries within the county in terms of both employment and revenue. European and other international tourism is an important element of the sector. The range of the service sector within the economy is broad, encompassing everyone from doctors to fast-food workers, and continues to grow as the county moves away from being a predominantly goods-producing economy. With regard to international trade and commerce, the growth of the global economy and Miami-Dade County's proximity to Latin America and the Caribbean have made it a significant center of business within the western hemisphere. Imports and export revenues are substantial and continue to grow rapidly (reaching 56 billion in 2000). With regard to infrastructure, the Port of Miami is the leading cruise ship port in the world and a leading cargo port connecting hundreds of ports and countries. Miami International Airport leads the nation in international freight volume. Retail trade within the county is wide-ranging and includes more than 11,000 establishments, from eating and drinking to apparel. Retail trade is the most significant element of the trade sector with regard to revenue, payroll, and employment. Within the economy, it is evident that several of these sectors "overlap" each other. The tourism and service sectors are highly significant elements of the economic base of the county but the tourism sector also includes significant components of the service (hotels, theme parks, night clubs) and retail trade (food and beverage, apparel) sectors.

The county economy is positioned both geographically and economically to not only be the "Gateway to the Americas," but also a growing economic hub for international commerce and

travel. The multifaceted tourism sector -- which includes various elements of the cruise and aviation industries, and the service and retail sectors -- forms a significant foundation for the development of many other industries within the county economy.

Economic Importance of Tourism

Tourism and Employment

For more than a century, the tourism industry has been the largest employer in Miami-Dade County, and currently no other industries are as important to the economic health and well-being of the county economy (Beacon Council 2000). As shown in Table 9, during 2001 the county attracted 10.5 million visitors, an increase from 9.8 million in 2000, countering a national trend of falling visitor numbers (Beacon Council 2002). Of the 10.5 million visitors, 5.26 million (50 percent) were domestic U.S. and 5.24 million (50 percent) were international. Of the 5.24 million international visitors, 41.3 percent came from South America, 7.9 percent from Central America, 13.3 percent from the Caribbean, 23.3 percent from Europe, 11.2 percent from Canada, and 3 percent from other points of origin (Greater Miami Convention and Visitors Bureau 2002).

Table 9. Miami-Dade County Visitors

Total Visitors	1991	1995	2000	2001
Domestic	4,377,400	4,317,600	4,461,600	5,260,000
International	4,024,600	5,061,600	5,369,400	5,240,000
Total	8,402,000	9,379,200	9,831,000	10,500,000

Source: Greater Miami Convention and Visitors Bureau 2002.

Recent visitor statistics produced by the NPS showed that in 2001 the park attracted approximately 490,000 visitors. This figure rose to approximately 513,000 visitors in 2002. According to a visitor study carried out in 2001, the vast majority of visitors were domestic U.S. (89 percent) and primarily drawn from Florida (80 percent). Only 11 percent of park visitors were international and were primarily from Canada, Cuba, and Germany (NPS 2001, 2002).

In 1998, the visitor industry in Miami-Dade County generated approximately \$12 billion for the local economy. By 2001, this figure of direct economic impact had risen to \$13.9 billion and centered on such areas as hotel rooms, restaurants, bars, shopping, transportation, and attractions (Greater Miami Convention and Visitors Bureau 2002). Further, the indirect economic impact generated by visitor expenditures in 2001 (i.e., visitor industry suppliers and related industries

such as real estate, medical, and retail) amounted to \$8 billion, for a total direct and indirect economic impact of \$21.9 billion. Visitors contribute more than one-third of the sales tax revenues and support industry-related expenditures through special taxes (Beacon Council 2002). In 2001, the visitor industry generated \$94 million in tourist-related taxes and \$665 million in state sales tax. The \$665 million represents 35 percent of the \$1.9 billion in state taxes generated in the county.

In 2000, the tourist industry accounted for approximately 14 percent of employment within the county, equating to roughly 140,000 jobs (Beacon Council 2002). In 2001, airlines, hotels/motels, restaurants, bars, and attractions employed nearly 126,000 people. In addition, approximately 239,000 were employed in industries that benefit from visitor expenditures. Thus, 365,000 jobs in Miami-Dade County were directly or indirectly dependent upon the visitor industry (Greater Miami Convention and Visitors Bureau 2002). The importance of the revenue, employment, and tax aspects of the visitor/tourist industry in Miami-Dade County cannot be understated.

The Miami-Dade County economy experienced a slowdown following the events of September 2001, with the visitor industry one of the economic sectors most severely impacted. The economy rebounded quickly though. For example, while hotel occupancy fell markedly in the following months, by June 2002 it had returned to less than 5 percent below what it was in June 2001 (Beacon Council 2002).

Tourism and Sales

The tourism industry contributes a large portion to the overall economy with \$13.9 billion in direct expenditure. As shown in Tables 10 and 11, the retail sales sector makes up an even larger portion of the economy, with in excess of \$27 billion in revenues during 2000. The largest categories, automotive dealers and food stores, generated \$7 billion and \$4 billion, respectively. Though comparatively lower, revenues from eating and drinking establishments, and general merchandise and apparel stores at \$2.3 billion and \$2.2 billion, respectively, during 2000, remain very significant components of the county economy.

Tourism expenditure within the retail trade sector is significant in both nature and size. In the case of Miami-Dade County, while no exact figures are available for the overall tourism-related expenditures covering all of the specific components of the retail trade sector, some general totals are available. It was estimated that during 2001 average daily tourist/visitor expenditures for shopping totaled \$78.15, or \$2,491.6 million for the year (16.8 percent of total visitor

Table 10. Retail Sales Trends in Miami-Dade County (in thousands)

Year	Amount	Change
1993	\$17,971,017	—
1994	\$19,846,656	10.4%
1995	\$20,387,554	2.7%
1996	\$21,396,408	4.9%
1997	\$21,792,534	1.9%
1998	\$22,808,518	4.7%
1999	\$26,897,557	17.9%
2000	\$27,024,821	0.5%

Source: Sales & Marketing Management. Beacon Council 2002.

Table 11. Retail Sales by Store Group (in thousands)

Outlet	1995	1998	1999	2000
Total Retail Sales	\$20,387,554	\$22,808,518	\$26,897,557	\$27,024,621
Food Store Sales	\$3,037,297	\$3,470,681	\$3,946,083	\$4,152,894
General Merchandise Store Sales	\$2,287,667	\$2,211,263	\$2,678,862	\$2,319,020
Eating & Drinking Place Sales	\$1,997,246	\$2,261,419	\$2,311,423	\$2,319,020
Furniture/Home Furnishing and Appliance Store Sales	\$1,619,078	\$1,999,805	\$1,679,691	\$1,617,274
Automotive Dealer Sales	\$4,901,066	\$5,267,809	\$7,259,393	\$7,353,581
Apparel and Accessories Store Sales	\$1,607,701	\$1,730,597	\$2,044,214	\$2,224,805
Drug Store Sales	\$1,096,769	\$1,362,512	\$1,613,853	\$1,868,527

Source: Sales & Marketing Management, Beacon Council 2002.

expenditure), and expenditure for meals (restaurant and hotel) totaled \$99.26, equating to 3,173.6 million for the year (22.8 percent of total visitor expenditure). These two categories total almost 40 percent of the overall visitor expenditure made within the county during 2001.

The engine of economic growth for any region is its export industries (i.e., industries that bring “new” money into the local economy). As this “new” money flows through the economy, it creates local income and demand for imports (Johns et al. 2001). The expenditures by visitors generate income and jobs within the industries that supply goods or services to the visitors.

Given the size of both industries/sectors, the general amounts of expenditure being discussed, and the export nature of the tourism monies, it can be concluded that the tourism expenditure is to be considered very significant with regard to the retail trade sector.

Marine Recreation and the Local Economy

The various economic activities associated with boating and recreational fishing in Miami-Dade County generate considerable contributions to the local economy. While revenue data are available for retail categories specific to boating and fishing activities, such as motorboat and yacht dealers (gross revenues of approximately \$402 million within the county during 2001 [Florida Department of Revenue 2002]), individuals engaged in recreational fishing and boating purchase a wide variety of gear and supplies. Expenditures can include fishing tackle, bait, clothing, food and beverage supplies, and diving equipment. While these expenditures are made by both resident and non-resident anglers and boaters, the latter group contributes additional economic impact to the economy by bringing “new” money into the county.

Recreational Expenditures

Typical expenditures made by visitors related to recreational fishing and boating activities while visiting coral reefs in Miami-Dade County were outlined by Johns et al. (2001) and included such categories as boat fuel, tackle, bait, food and beverages (restaurants and stores), ice, and general shopping. Retail sales based on these categories accounted for, on average, 54 percent of total daily fishing expenditures (\$94.91), and 51 percent (\$54.77) of total daily diving expenditures. Total visitor reef-related expenditures amounted to \$572 million over a 12-month period, illustrating the overall significance to the economy of retail sales to boating and fishing activities within the county.

Biscayne Bay is considered one of the premier recreation areas of the world but it also generates a great deal of local economic activity as well. It has been described as a “defining feature of life” within Miami-Dade County (Biscayne Bay Partnership Initiative 2001). Thousands live or work within walking distance of the shoreline, and many more live within a few miles of the bay. The bay offers myriad opportunities for recreation, education, and spiritual nourishment to those who visit and live near it (Greater Miami Chamber of Commerce 1999). Florida is an “outdoors” state, and the lifestyle within south Florida is symbolized by marine recreational activities such as boating and fishing. Imagery capturing this lifestyle is consciously marketed worldwide. Miami-Dade County and Biscayne Bay in particular offer unique opportunities for marine recreation and particularly those associated with recreational boating and fishing. There are few other examples of a large year-round protected bay with a diversity of natural resources so close to a major metropolitan area (Austin 1971). The infrastructure supporting the various forms of coastal boating recreation within the county is extensive and includes over 50 boat ramps, over 95 marinas, dry storage for over 3,000 boats, and over 100 artificial reefs. Marine recreation in

its many forms is an integral part of the lives of many of the county's residents. Registered pleasure vessels within the county, as of 2002, numbered 54,991 equating to one boat for every 32 residents (Florida Department of Highway Safety and Motor Vehicles 2002).

As outlined above, the marine recreation industry is of high commercial importance to the local economy. In the case of fishing, the primary economic attribute is "fishing," not fish. Fishing is recreational experience, and as such the person recreating is willing to pay for many other components or attributes that enhance the recreational experience. Across the county there are many businesses that either directly facilitate or indirectly support the different elements of the marine recreational experience. Marine recreation within the county supports manufacturers, suppliers, and service industries. For example, boat sales and service centers, charter/party operations, marinas, dive-shops, bait/tackle sales are all primary beneficiaries of visitor and resident recreation expenditures. However, secondary expenditure on related support services including restaurants, hotels, food and beverage sales, apparel and general merchandise is also of significant economic value to a wider array of local businesses. The total economic output of the recreational saltwater fishing industry is substantial and supports an extensive number of full and part-time jobs (Fedler and Nikum 1991). On a wider economic level, visitor-based recreational expenditure is an "export" industry made more potent given the increased economic value of the "new" money entering the economy. This increased economic value is directly related to the number of times a dollar originally spent by a fishing tourist gets "re-spent" before leaving the county (with the number of times re-spent termed a "multiplier" by economists).

Marine recreation is integral to both the economy and the quality of life within Miami-Dade County. The widespread opportunities for such activities as boating and fishing within the county and Biscayne Bay in particular include benefits to the populace that extend and intertwine both socially and economically.

Commercial Boating

For the purposes of this study, commercial boating includes businesses such as party boat operations that charter vessels or rent watercraft. A party boat is defined as a passenger vessel that books clients individually; whereas, a charter boat is defined as a passenger vessel that can be "hired" by a group of persons for exclusive use (Johns et al. 2001). These businesses are mostly contracted to transport parties in most cases for recreational fishing, snorkeling, or sightseeing activities. There is also a dive/boat tour service that operates under a licensed concessionaire agreement that has exclusive rights to diving trips within the park.

Information pertaining specifically to the revenues associated with commercial boating is limited. Instead, the majority of recent economic analyses focus on the wider economic activities of the marine recreation industry such as sport fishing and scuba-diving, within which commercial boating is only one element of the associated overall expenditure. However, a recent study completed by Johns et al. (2001) detailed the economic value of the activities related to reef visitation within Miami-Dade County by examining the individual components of recreational expenditure. The study concluded that, on average, visitor boaters spent \$75 per person per day on charter boats and \$30 per person per day on party boats while visiting the county's reefs to dive, fish, etc. The report concluded that, over a 12-month period during 2000-2001, contributions to the county economy of \$40.8 million and \$343,000 were directly attributable to expenditures for charter/party boat fees and glass-bottom boat operators, respectively.

The study concluded that the total visitor expenditures per person per day while participating in reef-related recreational activities within the county amounted to \$224 (charter boat) and \$194 (party boat) for fishing, and \$125 (charter or party boat) for scuba diving. The report concluded that visitors who used the reefs in Miami-Dade County had a total expenditure of \$572 million during the 12-month period.

Another commercial boating use within the bay is represented by several towboat companies, several of whom operate within the park. Some are associated with national organizations like SeaTow and Boats/US (EDAW 2003). In addition, the Intracoastal Waterway, a commercial shipping channel, traverses the bay and the park.

The commercial boating component of the county's marine industry is considered a relatively minor but important element given the amount of additional revenue that is consequently generated by the anglers and divers chartering the vessels.

Contributions of Biscayne National Park to the Local Economy

There are several ways in which the recreational/visitation uses of Biscayne National Park contribute to the economy of the county: park-related employment and expenditure; commercial activities occurring within park boundaries, and recreational visitation (land and water based).

During 2002, expenditure and employment by the park included approximately \$365,000 in costs and marginally over \$3 million in wages. The park currently has 48 full-time employees, of

which 19 are from the local/surrounding communities (Sanchez personal communication 2002). This is a positive attribute, but one of minimal importance to the regional economy.

Land-based recreational visitation within the park occurs mostly via the Visitor Center located at Convoy Point near Homestead, Florida. Two other facilities, Homestead Bayfront Park and Marina and Black Point Marina, are commonly used to gain access to the park. Both are county facilities and have fee-based entrance systems, charge mooring fees, and have limited visitor service facilities. Expenditures by anglers, boaters, and divers entering the park from these and other facilities are discussed below in conjunction with total water-based recreational activities.

There is only minimal expenditure-oriented economic value associated with the Visitor Center. Entrance to the park is free, and many of the most popular activities conducted by visitors including shoreline fishing, picnicking, sailboarding, and bicycling (NPS 2001), have little or no revenue associated with them. What commercial activities there are center around the gift/snack shop and one fee-based dive/boat tour service (operating under a licensed concessionaire agreement) that conducts tours and diving/snorkeling trips. A recent visitor study (NPS 2001) points to aspects where indirect economic benefits from this visitation may occur. Approximately 30 percent of visitors surveyed said that they spend one night away from home during a visit, and almost 60 percent spent at least one to three nights within the Florida City/Homestead area. As such, park visitors who stay in a hotel/motel would generate additional secondary economic service-based benefits. While potentially significant to the Florida City/Homestead economies, this is of minimal importance to the regional economy.

Water-based recreational visitation includes fishing, boating, and diving within the park. Recreational fishing is among the most popular activities in the park. In 1997, an estimated 50,000 vessels used the park for a variety of activities; by 2004, that estimate had increased to 85,000 (based on data reported in Ault et al. 2005). Of the 1997 total, it was estimated that almost 30,000 boats participated in fishing activities (Lockwood and Perry 1997). Pleasure boating and diving are also important recreational activities within the park. The vast majority of vessels that utilize the park are local (i.e., registered within Miami-Dade County).

A recent study (Johns et al. 2001) estimated expenditures for recreational fishing and diving at the many reefs within the waters of Miami-Dade County. The reefs of Biscayne National Park, situated east of Boca Chita, Elliot, and Adams Keys, are part of a 150-mile-long chain of coral reefs extending down through the lower Florida Keys and the Caribbean. Anglers and divers were surveyed regarding many aspects of the expenditures incurred before, during, and after their recreational activities. Typical trip expenditures could include private transportation,

groceries, take-out food, restaurants and bars, lodging, boat fuel, party/charter fees, access boat lodging, guide fees and charges, and equipment rental and purchases.

Due to the difference in economic power of a visitor dollar compared to a resident dollar, estimated daily expenditures were broken down by resident/visitor status. It was estimated that the average resident daily trip expenditures when fishing or diving/snorkeling totaled \$276 and \$219, respectively. The report concluded that direct resident fishing and diving expenditures totaled \$165 million and \$110 million, respectively, over the 12-month period of the study. Average visitor daily trip expenditures when fishing totaled \$114 (own/friend's boat), \$225 (charter boat), or \$194 (party boat). Diving/snorkeling expenditures totaled \$87 (friends' boat) and \$125 (charter boat). Total direct visitor expenditures (fishing, boating, and diving/snorkeling) totaled \$572 million over the 12-month period of the study. Using this study as a relatively recent guide to typical daily marine recreation expenditures within the county, and hence the park, in conjunction with the 1997 boat traffic estimates, it is evident that direct marine recreational expenditure within the park is substantial.

Given the size, nature, and uses of the park, it is intrinsically difficult to accurately place value on all of the recreational resources present; however, the substantial value of marine recreation within the wider economy is evident. This is indicated specifically through the related direct and indirect economic value of expenditures pertaining to recreational fishing, boating, and diving activities to the wider county economy. Given its size and proximity, the role Biscayne Bay plays in creating this value cannot be understated. It must therefore be concluded that Biscayne National Park, encompassing a large, heavily utilized central portion of the bay, is also of substantial economic benefit to the wider county economy in relation to marine recreation.

FISHING IN THE LOCAL SOCIAL AND ECONOMIC CONTEXT

Overview

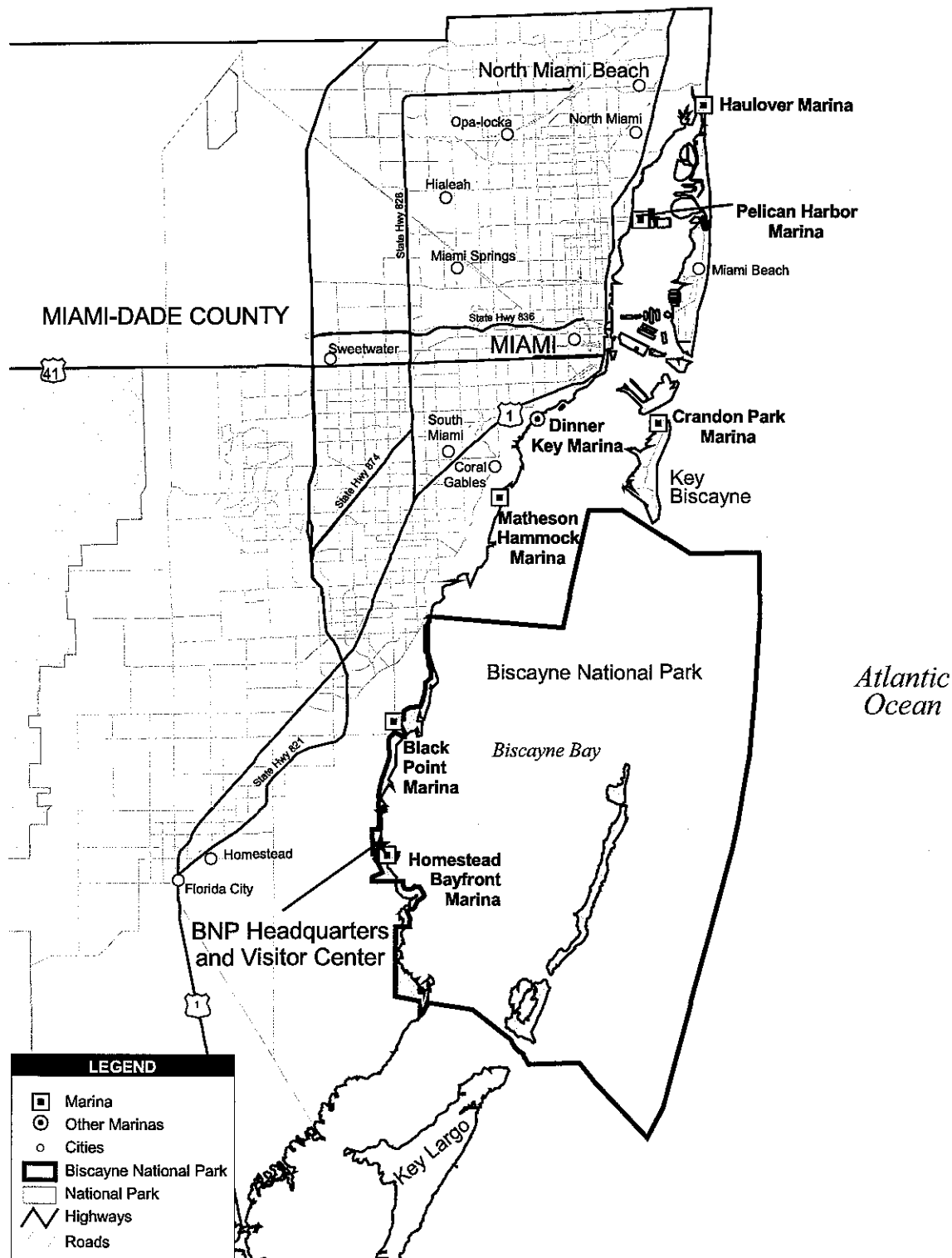
This section provides an overview of commercial, recreational, and subsistence fishing in Biscayne National Park. Subsequent sections provide detailed statistical information on fishing within the park, and results from ethnographic interviews conducted for this study in order to place recent quantitative information in the local community and economic context.

Commercial Fishing

Commercial fishing has a long history within the bay and has been permitted within the park since its inception as a National Monument in 1968. The commercial fishing industry within the bay is small in scale. The larger commercial fishing vessels are located primarily at Black Point Marina, but fishing vessels are also located at various other marinas around the bay (Figures 13 and 14). The smaller commercial operations within the bay consist of mainly trailered vessels that gain access from other points in or near the park including Matheson Hammock or Homestead Bayfront Marinas. Commercial fishing continues to be an important local maritime activity for some area residents but overall is declining.

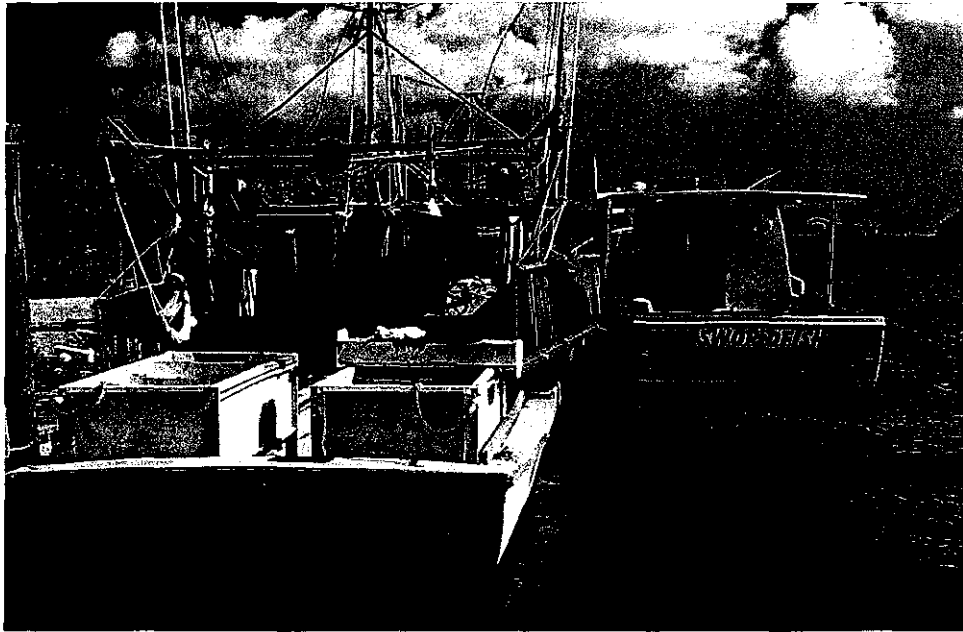
The primary commercial species caught in Miami-Dade County include blue crab, stone crab, spiny lobster, pink shrimp, king mackerel, ballyhoo, and yellowtail snapper. Commercial fishing vessel landings data in Florida are reported using a trip ticket system. Fishermen fill out trip tickets, itemizing catch, trips, and area fished. While the larger reporting area for Biscayne Bay is Miami-Dade County, there is a subset for the bay, which includes Biscayne Bay, Barnes Sound, and Card Sound to the south. Annual catch totals for the entire Miami-Dade County region fluctuated between 1.3 and 2.2 million pounds for the period between 1990 and 2001. Preliminary 2002 data show that slightly more than 1.2 million pounds were landed during the year and, using statewide average price data, the commercial fishery within the county is valued at approximately \$2.5 million (Florida Marine Research Institute 2003). Overall, there has been a continuing decrease in the number of commercially registered fishing vessels, which fell from a total of 1,353 vessels in 1989-1990 to 757 vessels in 1998-1999. There is a similar trend in the number of Saltwater Products Licenses issued within Miami-Dade County. All persons fishing commercially are required to possess a Saltwater Products License. During 2002 a total of 867 licenses were issued, having fallen from 1,147 in 1990 (Florida Marine Research Institute 2003).

The primary species sought within Biscayne Bay (including areas outside Biscayne National Park) by commercial fishing include finfish (snapper grouper complex, mullet); invertebrates (stone crab, blue crab, spiny lobster); pink shrimp; and bait shrimp (Florida Fish and Wildlife Conservation Commission 2001). In 1997, the value of the commercial fishery within the bay was \$1.5 million (Ault et al. 2001). The aggregate dockside value of commercial catches from 1997 to 1999 was approximately \$4.7 million. During this time, pink shrimp, blue crab, stone crab, and spiny lobster accounted for 93 percent of the total value (Ault et al. 2001); however, commercial landings for most of the major species declined toward the end of the 1990s (Florida Marine Research Institute 2002). The most important commercial fishery within the bay is the



Sources: Florida Fish & Wildlife Conservation Commission, Biscayne National Park

Figure 13
Miami-Dade County Marinas
near Biscayne National Park



Commercial fishing vessels at Black Point



Commercial fishing vessels at Dinner Key Marina

Figure 14
Photographs of Local Commercial Boats

bait shrimp fishery (Lockwood and Perry 1997, 1998). During the period 1999 to 2001, landings and trips data show that the majority of blue crab and the vast majority of the bait shrimp are taken from the Biscayne Bay region, with the other species less important in the context of total countywide catches. Preliminary 2002 landings data show a continuation of that trend with the vast majority of bait shrimp landed countywide taken within Biscayne Bay and, while remaining significant, shrimp and other invertebrates were again of proportionally lower importance to countywide totals (Florida Marine Research Institute 2003).

Another aspect of commercial fishing within the bay is guided sport fishing, primarily for bonefish. In smaller boats, hired guides take one or two customers, mainly to the flats on the east or west sides of the bay. Estimates of the number of guides actively working in the park varies, with a recent study (EDAW 2003) estimating there were about 12 full-time guides and 36 part-time guides using the area, based on interview data. Full day rates range from between \$375 and \$600 daily, depending on the level of experience of the guide (EDAW 2003).

With total revenue of less than \$1.6 million (preliminary 2002 data), the falling number of licensed vessels operating within the county, and the limited and partially seasonal employment levels, the commercial fishing industry within the Biscayne Bay area is of relatively limited regional economic importance (Florida Marine Research Institute 2003). However, the fisheries within Biscayne National Park may be important to specific communities and industry segments. Detailed information on current commercial fishery efforts and ties to particular groups and communities is provided in a subsequent section.

Recreational Fishing

Recreational fishing is among the most popular activities in the park, and recreational users fish both from land-based canals within park boundaries and on boats in park waters. Previous studies on fisheries have focused mainly on the fishing activities undertaken while on the water, i.e., on vessels or using dive gear (Ault et al. 1997, 2001; Seidenfeld 1999; Harper et al. 2000). While an excellent, extensive dataset exists for recreational fishing off boats in Biscayne National Park (see Lockwood and Perry 1997, 1998; Harper et al. 2000), there is little information on recreational fishing from canal banks and off the shoreline aside from work undertaken for the recent Ethnographic Overview and Assessment for the park (EDAW 2003). In that report, interview and observation data were collected to describe various types of recreational fishing within Biscayne National Park. These data indicated that recreational fishing in the park can usefully be divided into three types: shoreline, inshore, and offshore. Important inshore fisheries exist on the flats (i.e., shallow water sand and coral bottoms) and in deeper

waters around coral heads and open water. The offshore fishery occurs outside the limits of the bay in deeper waters near the Gulf Stream. The species sought, fishing technology, and boats for each type of fishing are different. Shoreline fishing takes place from jetties at Convoy Point and Black Point, in the canals that flow into Biscayne Bay, and from the shorelines that are adjacent to these canals. Each of these types of sport fishing is briefly described below.

Shoreline Recreational Fishing

On most weekends or in the late afternoons during the week, people can be observed shoreline fishing at places such as Mowry Canal and Convoy Point (Figure 15). Persons fishing may consist of single individuals, a parent and children, and family groups or mixed groups of men and women. The characteristics and activities of these shoreline fishermen were determined by interviews with park enforcement personnel who patrol the shoreline areas and by interviews with fishermen at various shoreline locations within Biscayne National Park.

As described in the Ethnographic Overview and Assessment (EDAW 2003), the work of characterizing shoreline fishing began with the identification of canals and shoreline sites used by recreational fishers in Biscayne National Park. This involved traveling to each accessible canal and shoreline site, starting with Black Point Marina, which includes the confluence of Black Creek and Goulds Canals, Military Canal, and Mowry Canal, and ending at Convoy Point near the Visitor Center and Homestead Bayfront Park. Of the sites visited, only Black Point Marina, Mowry Canal, Convoy Point, and Bayfront Park are directly accessible to land-based visitors. Furthermore, no land-based fishing was observed in Bayfront Park during the weekend observation visits to identify possible sampling sites. The absence of fishermen at Bayfront Park at these times may have been a random occurrence or related to the park's entrance fee and limited shoreline opportunities for fishing. On other occasions during this work, fishermen were observed on the shoreline at Bayfront Park and Biscayne National Park staff report that it is common to observe people fishing from Homestead Bayfront nearly every evening and night. The sites chosen for the interviews were Black Point Marina, Mowry Canal, and Convoy Point because of the weekend presence of fishermen at all of these locations. The former two areas are canal-based, and the latter contains an extensive shoreline conducive to fishing.

Information was gained from a total of 65 interviews completed on four consecutive Sunday afternoons in April of 2002. Sundays were selected for interviews because this was the day of the week that the most fishermen were observed at these locations during the initial observation periods to identify possible interview sites. Interviewers approached every other person at these



Figure 15
Canal Fishing in Biscayne National Park

sites to participate in the interviews. Twenty-two persons were interviewed at Black Point Marina, 22 at Convoy Point, and 21 at Mowry Canal. The interviews addressed the reasons for each user's visit to the particular site, their knowledge of the area, the species they target, the changes observed in the fishery, and whether the users knew that they were fishing within Biscayne National Park. Observations were also recorded about the overall number and composition of fishers present at each site.

The results of these interviews are summarized by topic and site.

- **The reason for fishing at the particular site.** Over 86 percent of the 65 persons chose the particular site where they were fishing due to its proximity. Factors such as better fishing and crowded conditions did not play a role in site selection. In fact, the second most-stated reason for site selection (11 percent) was due to the site's amenities, such as picnic facilities, views, etc. The values were similar for all three sites, suggesting that all sites are selected due to their proximity rather than other attributes.
- **Frequency of visits.** Most of those interviewed (40 percent) reported fishing every week, followed by 28 percent who fish once a month. An equal percentage was visiting for the first time. These frequencies are similar across sites.
- **Fishing at other sites.** Most fishers reported using other sites, including others in Biscayne National Park. A total of 72 percent use other areas, and 24.6 and 26.2 percent use Convoy Point and Mowry Canal, respectively. Black Point Marina is less popular as a secondary site, as only 1.5 percent of the 65 persons indicated it as such. Only 45 percent of fishers at Black Point Marina reported fishing elsewhere, compared to 87 percent and 86 percent, at Convoy Point and Mowry Canal, respectively. Sixty-eight percent of Convoy Point fishers reported using Mowry Canal, similar to the 67 percent of Mowry Canal fishers who use Convoy Point.
- **Species targeted versus abundant species, and changes in resource availability.** Four out of five anglers (or 82 percent) target snappers, 59 percent target jacks, 11 percent target barracuda, and 11 percent target other species (including sharks, pompano, mullet, and others). At each site, the species targeted are similar. Anglers at each location also report snapper as the primary target for fishing effort. Anglers also report they perceive that snappers are the most abundant species (55 percent) followed by jacks (49 percent), barracuda (31 percent), and others (26 percent). Generally, species abundances were reported more frequently (for all species) at Black Point Marina than at the other two sites. Convoy Point displayed the lowest percentages of abundances, for either targeted or non-targeted species. A majority of fishers believe that there have been no changes in the

fish abundance; however, 40 percent did state that they do not know if there have been changes. Interestingly, among the changes noticed, 23 percent believe that there are fewer fish, and 8 percent believe that fish size has declined. There are no site-specific differences concerning perceptions of change in fishing abundance, and a majority from all three sites reports no perceived changes.

- **Personal and observed gear use.** Every fisher surveyed stated that they use hook-and-line or pole gear. Five percent reported observing fishers using other gear, including variations on hook-and-line gear (called yo-yos) and cast nets.
- **The use of fish caught.** No one interviewed reported selling their catch. Eighty-nine percent reported eating their catch if of legal size. Almost all fishers who reported eating their catch qualified their answer by adding that they release undersized fish. Eleven percent reported that they release all fish. Catch-and-release fishing was more frequently reported by fishers at Black Point Marina (23 percent) than at the other two sites (less than 5 percent).
- **Fisher numbers and site recruitment.** Most of the fishermen at these sites are local residents, with an average of about 33 persons per site. However, the range is very high (from 20 to 70 anglers). About 22 percent of the fishers were introduced to the site through their family, and almost a third (32 percent) learned about the site via friends. Only 12 percent discovered the site through road signs, and an even lower percentage (6 percent) read about the site in a brochure or fishing literature.
- **Participation in other activities apart from fishing.** Most anglers (65 percent) participate in other activities apart from fishing, including picnicking (57 percent), swimming (25 percent), walking (9 percent), and boating (15 percent). Black Point Marina and Convoy Point attract fishers interested in a variety of activities, especially at the latter site. Conversely, Mowry Canal anglers do not participate in many other activities apart from fishing.
- **Site knowledge.** Twenty-nine percent of the respondents knew that the land from which they were fishing belongs to Biscayne National Park. However, over two-thirds (68 percent) have heard of Biscayne National Park. Half of the Convoy Point fishers knew that the site is owned by the park, compared to 23 percent of Black Point Marina fishers and 14 percent of Mowry Canal fishers; almost a quarter of the respondents from the latter sites believe that their sites are owned by the State of Florida. The higher percentage of awareness among Convoy Point fishers is expected, as Convoy Point has a number of signs welcoming visitors to Biscayne National Park. Finally, over 70 percent of Mowry Canal and 77 percent of

Convoy Point respondents had heard of Biscayne National Park, compared to 55 percent of Black Point Marina fishers.

This earlier work (EDAW 2003) suggests there is a considerable concentration of anglers who use Biscayne National Park canals and shoreline for recreational fishing. The visitors at the sites are ethnically diverse but do not show a concentration towards a single ethnic group (when compared with the county's demographic profile). This work also determined that there are differences in the levels of exclusivity that fishing enjoys among sites, as some sites are more suitable for multiple-use activities. Finally, this work concludes that while there is much local knowledge that fishers have about the area, a smaller percentage of them know they are fishing in Biscayne National Park waters. While Black Point Marina and Convoy Point are clearly marked as public facilities, there are no signs near Mowry Canal that indicate the area is part of Biscayne National Park or is otherwise public land.

Fishers were usually local residents. For example, fishers who travel to Black Point Marina almost never fish in the other two sites (or in any other Biscayne National Park sites). Similarly, there is only exchange among anglers between the adjacent Mowry Canal and Convoy Point sites, and not between the more northern Black Point Marina.

In terms of characterizing the groups or communities linked to shoreline fishing, when first examined the ethnicity of visitors at the canals and shoreline appears skewed toward Hispanics. However, it should be noted that Hispanics make up the majority ethnic group in Miami-Dade County, comprising 57.3 percent of the 2.25 million residents (U.S. Bureau of the Census 2001a). African-Americans and Anglo-Americans make up 20.3 percent and 20.7 percent of the county's population, respectively. Of the 522 persons observed during the 12 observation sessions, 60.3 percent were Hispanics, 28.5 percent were African-American, and 11.1 percent were Anglo-Americans. This shows that, demographically, Anglo-Americans are underrepresented, while African-Americans are overrepresented. But, the study does not take into account the subregional demographics, namely of southern Miami-Dade County, as most of the respondents in the study stated that they were local residents and selected the sites due to proximity; subregional demographics may well demonstrate that the visitors represent a cross-section of the area's ethnicity.

Although site selection is determined largely by proximity (as stated by the respondents), site fidelity and repeat visits are related strongly to the types of activities in which the fishers participate. For example, Convoy Point fishers reported the lowest abundances of targeted species; however, this group also stated participation in the most non-fishing activities.

Therefore, Convoy Point, which has an extensive shoreline with picnic facilities, provides more than a fishing experience, compared to Mowry Point and Black Point Marina. These latter sites are canal-based, and they do not offer many other amenities. Accordingly, although several respondents at Black Point Marina do participate in other non-fishing activities, a little more than a third at Mowry Point do anything else but fish. These differences are important, as they demonstrate that while fishing may be the ostensible reason for visitation, there are other reasons for site selection in Biscayne National Park. This is reinforced by the fact that a majority of the fishers did not report either selling or retaining all fish. Instead, most respondents release undersized fish, and a smaller percentage releases all fish. Park law enforcement personnel report that retention of undersized fish continues to be a problem, and their observations regarding consumption of caught fish being a primary objective of shoreline fishing is consistent with interview findings.

Inshore Recreational Fishing

An overview of inshore fishing within Biscayne National Park is available in the Park's Ethnographic Overview and Assessment (EDAW 2003) and is summarized in this section. Unfortunately, for the purposes of this assessment, it was not feasible to perform the same type of data collection for inshore recreational fishing as for shoreline fishing since inshore fishing takes place in boats in the bay. However, interviews with Biscayne National Park staff and with individuals who participate in inshore fishing provided an outline of inshore fishing activities. There are guided and unguided inshore fishermen. The unguided fishermen fish within the bay for blue crabs, stone crabs, and a wide variety of finfish, and outside of the bay proper for lobster (as most of the bay is a lobster sanctuary). Most of these fishermen use conventional gear, although there are some who spear fish and still others who fly fish. There is also a guided component of the inshore fishery that focuses on flats fishing for bonefish, tarpon, and other gamefish using light tackle, including fly fishing gear.

Inshore guided fishing is exemplified by the bonefishery. Bonefish (*Albula vulpes*) feed in shallow water on shrimp, crabs, and other crustaceans, as well as other fish. Bonefish are usually not eaten, but they are a highly prized gamefish. The bonefish of Biscayne Bay are noted for their size, averaging 7 plus pounds, which attracts anglers seeking these larger fish. Fishermen who fish for bonefish may also target tarpon, kingfish, snook, permit, and other species of opportunity. The number of bonefish guides varies from season to season, but there appears to be about a dozen full-time operators, and perhaps three times that many part-time or occasional guides. Guides from Key Largo and Islamorada also fish in Biscayne Bay because of its reputation for larger fish. Guides often specialize in fly fishing or conventional gear, although

there are guides who will use either gear type. Some are locals who have guided for many years, while others are seasonal guides from outside of the area who may fish Biscayne Bay in the winter and Alaska in the summer. Bonefish guides typically use small boats in the 18- to 25-foot range, powered by outboards and adapted to shallow water fishing. These vessels are typically kept on trailers. Fishing is done on a half-day or full-day basis, with the former being more popular. Homestead, Bayfront, Black Point, or Matheson Hammock Marinas each has bonefish guides.

More popular fishing areas are the flats on the east or west sides of the bay, or the seaward side of Elliott Key. Early morning is preferred, although bonefishing is highly dependent on tides, since the fish tend to feed on moving tides. Once within the fishing grounds, the motor is turned off and the boat is moved by means of a 20-foot-long graphite pole with a "foot" to prevent it from sinking into the bottom. The guides' responsibility is to spot the fish and suggest to their clients how to place their lure or fly to ensure the best chance of a take. Still water represents the best conditions because it is important to be able to see the fish. At the same time, bonefish and other flats species are highly sensitive to movement and flat, calm conditions present a special challenge for anglers since they are more easily observed by bonefish at this time. Many anglers prefer a slight chop on the water since this obscures the fish's vision but allows the angler to still see the fish. The guides pole their boats through likely sand and grass flats seeking fish, then move between fishing areas using their motors.

Most guides work alone and take one or two customers at a time. The vast majority of customers are single fishermen, but there are a few parties composed of husband and wife, or husband, wife, and children. Clients have been characterized as typically middle-class people from south Florida, but not necessarily from the immediate park vicinity. Rates vary depending on the reputation and experience of a particular guide, but full days range from \$375 to \$600 per day.

A number of people who participate in the bonefish fishery, both as guides and fishermen, belong to the Miami Rod and Reel Club or the Ocean Reef Rod and Gun Club (based in Key Largo). These organizations promote catch and release techniques, sponsor fishing and environmental education programs for both youngsters and adults, and hold a number of fishing tournaments.

Unguided inshore fishing is a major pastime of Biscayne National Park users. Boaters are also sometimes casual fishermen, but fishing in the bay is an important type of use among residents of nearby communities. The county marinas as well as private docking facilities are the major points of access for fishermen who may fish from almost any type of powered, sail, or paddled

vessel, although fishing from a powered boat is the usual mode for inshore fishermen. Cruising near Sands Cut, throwing a line from the docks near Stiltsville, or anchored in boats near Christmas Point, fishermen catch gray and mangrove snapper, sea trout, a variety of jacks, as well as other species such as barracuda. Shrimp are a preferred live bait for inshore fishermen, although artificial lures thrown with spinning or bait casting tackle are popular fishing tactics. It appears these fish are caught to eat, although there are reports that some recreational fishermen catch an excess of their limits and sell these fish for commercial purposes. Enforcement rangers in Biscayne National Park report that poaching of various types is a common occurrence in the park, and this represents an ongoing challenge for resource management.

Offshore Recreational Fishing

The Ethnographic Overview and Assessment (EDAW 2003) also provides a brief overview of offshore recreational fishing, which has been summarized in this section. The offshore recreational fishing operations may be usefully classified into two sub-groups that vary in their use of the park, the areas they fish, and the species they target. The first subset is comprised of offshore fishing boats that often go up to 25 miles offshore. This group of vessels consists mainly of larger, diesel-powered boats in the 30- to 50-foot range. Day trips are typical for this group and these boats cruise at 12 to 20 knots and might consume 100 to 150 gallons of diesel per day. Preliminary research suggests that most of these offshore fishing boats that use park waters are kept in marinas at Black Point or Crandon, although they are also found at Homestead Bayfront and Matheson Hammock. Similar offshore fishing boats at Haulover and Pelican Harbor apparently enter park waters only infrequently. It is not known at this time how many offshore fishing boats of this type operate within park boundaries, but it is apparently a sizeable number, perhaps several dozen. They use park areas to prepare bait, but their main use of park waters is to pass through on their way to offshore fishing areas outside of the park, where they primarily target pelagics, including dolphin, tuna, and wahoo.

The second set of offshore boats comprises what could be considered a “nearshore offshore” fishery that takes place in the open waters outside of, but nearby, the outer keys within the park. This fishing takes place in waters from approximately 10 to 60 feet deep, with the 60-foot depth contour corresponding with the eastern edge of the park. The sea floor in the eastern half of this 4- to 5-mile offshore span is filled with thousands of patch reefs and there is a continuous reef along the eastern boundary of the park. Recreational fishers reach these reefs primarily from boats launched from Matheson Hammock, Black Point, and Homestead Bayfront marinas, and from Key Largo. Typically, the vessels used are 17 to 30 feet in length. Targeted species are snapper and grouper; however, since snapper and grouper are not very abundant, other species

are also frequently harvested, including jacks (family Carangidae), grunts (Haemulidae), and surgeonfish (Acanthuridae). This reef fishery is by far the most extractive sport fishery within the Biscayne National Park, and it also results in the fouling of reefs with lost or tangled hook-and-line gear (Kellison, personal communication, 2005).

The offshore sport fishing vessels include individually owned craft as well as sport charter vessels. Limited interview data suggest that perhaps 50 percent or more of the clients of offshore charter sport vessels are from south Florida and the rest are tourists from outside the area. Some skippers sell portions of the catch for additional income. Offshore charter captains also occasionally take out parties of divers, although the destination of the divers would have to be outside of Biscayne National Park due to terms of the park concessionaire agreement.

Most offshore fishing guides are apparently long-time area residents whose primary business or employment pursuit is charter fishing. The complexities and expense of obtaining the required licenses apparently tend to discourage part-time participation, as well as the expense of maintaining an offshore fishing boat. Like the inshore fishing guides, many offshore fishing boat captains are members of the Miami Rod and Reel Club.

Subsistence Fishing

There is currently no universally recognized definition of what constitutes "subsistence fishing" in Florida; however, it is commonly understood that the term refers to those fishers using simplistic equipment such as a traditional "cane-and-pole" gear (Lockwood personal communication 2002). Additionally, persons using such equipment are explicitly identified as being exempt from having to purchase a fishing license under Florida Statute 372.562 Recreational licenses and permits; exemptions from fees and requirements;

(d) Any resident fishing for recreational purposes only, within her or his county of residence with live or natural bait, using poles or lines not equipped with a fishing line retrieval mechanism, except on a legally established fish management area.

While (recreational) shoreline and inshore (canal) fishing can be commonly observed adjacent to Biscayne Bay, there is currently no sufficiently detailed information that shows the extent to which said persons fishing are conducting such activities for purely "subsistence" purposes (i.e., the catch forms a regularly important part of their overall diet). Recently, as noted above, a limited interview survey was conducted of shoreline and inshore fishers within Biscayne National Park (EDAW 2003). While it was ascertained that most anglers used hook-and-line, or

pole gear, and consumed their catch, it was also evident that most participated in activities other than fishing, such as picnicking, boating, and swimming.

As such, the relative importance of the activity remains undetermined. It may primarily represent an easily accessible, inexpensive form of recreation; a regular recreational pastime but with the consumption of the catch forming an infrequent portion of the individual's diet; or, as mentioned above, the catch constitutes a regular and important part of the fisher's diet. To draw any accurate conclusions, further detailed study would be needed.

Results of Recent Data Acquisition

For the purposes of filling data gaps specifically for the Fishery Management Plan (FMP) Environmental Impact Statement (EIS) analysis, two types of data acquisition were undertaken. While the existing socioeconomic data currently in draft for the ongoing Biscayne National Park General Management Plan EIS were nearly adequate for the FMP affected environment sections, there was an identified need to collect a *limited* amount of additional, fishery and fishery management data. This effort utilized two separate (but related) approaches. First, recent commercial fisheries effort and landings data were obtained from the state to provide a current quantitative description of ongoing fishing activities within the park. It was recognized, however, that the available quantitative data do not allow differentiation of activities within and near the park, nor do they allow a description of the specific links between fishery activities and the social and economic context of the involved communities. This recognition led to the second approach of conducting ethnographic interviews to supplement the available quantitative data. The intent of the ethnographic effort was to complete a limited number of targeted interviews and provide limited fisheries-specific data analysis to link Biscayne National Park resource utilization to particular groups and communities, by fishery, and to qualitatively expound on the economic flows between harvester and processor, and processor and end markets. The approach emphasized the generation of primarily qualitative descriptions that would show the direction, magnitude, and nature of the fisheries engagement and dependence rather than focus on survey-based sampling.

The results of these efforts are presented in two sections. The first section concerns fisherywide data as provided by the Florida Fish and Wildlife Conservation Commission in 2004. The second section summarizes findings from the 24 interviews conducted with commercial fishers and for-hire operators.

Current Quantitative Data

The fisherywide information discussed in this section refers to data collected by the State of Florida under its trip ticket reporting system (see FAC 68E-5.002). The area of concern is Biscayne Bay, which is denoted as 744 in the trip ticket reporting system, and which consists of the zones shown below.

As shown in Figure 16, there are nine zones that make up the 744 fishing area that corresponds to Biscayne Bay and surrounding areas. Of these, three zones (744.4, 744.5, and 744.8) are located entirely within Biscayne National Park. The changes to reflect the separation of fishing areas within the park from the rest of the Biscayne Bay area have only been made since 2003; thus, all data prior to 2003 lump Biscayne Bay (744.3), Barnes Sound (744.7), and Card Sound (744.2) and offshore waters (744.0) together and it is therefore not possible to parse out Biscayne National Park-specific fisheries data for years prior to 2003. (It should also be noted that for fishery statistics reporting, the term "Biscayne Bay" refers to the larger reporting area for years prior to 2003, which includes a limited offshore area outside the geographic limits of Biscayne Bay proper.)

As shown in Figure 17, the number of persons holding commercial fishing licenses (formally known as saltwater product licenses [SPLs]) who fished in Biscayne Bay increased in the early to mid-1990s, declined from 1996 to 1998, then almost doubled from 1998 to 2000, peaking at 276 holders. Since then, the number of SPL holders fishing in the Bay has declined again, reaching 1997 levels by 2003. Unfortunately, due to the previously described "lumping" of data, similar trend information for Biscayne National Park itself is not available.

Interestingly, the percentage of fishers residing in Miami-Dade County increased in the Biscayne Bay fishery in the decade from 1993 to 2003 as shown in Figure 18. In 1993, for example, Miami-Dade fishers made up fewer than 61 percent of the SPL holders fishing in Biscayne Bay. By 2000, Miami-Dade fishers comprised almost 90 percent of all Biscayne Bay fishers. However, the trends in total participation followed that of the entire fishery, in that participation peaked in the late 1990s and early 2000s but then declined (by over 52 percent from 2000 to 2003). While these trends may suggest a downturn in the local (Biscayne Bay) fishery, as indicated by fishery data collected by Ault et al. (1997), it is interesting to note similar trends across the state and in Monroe County, which is among the state's most prolific fishing counties.

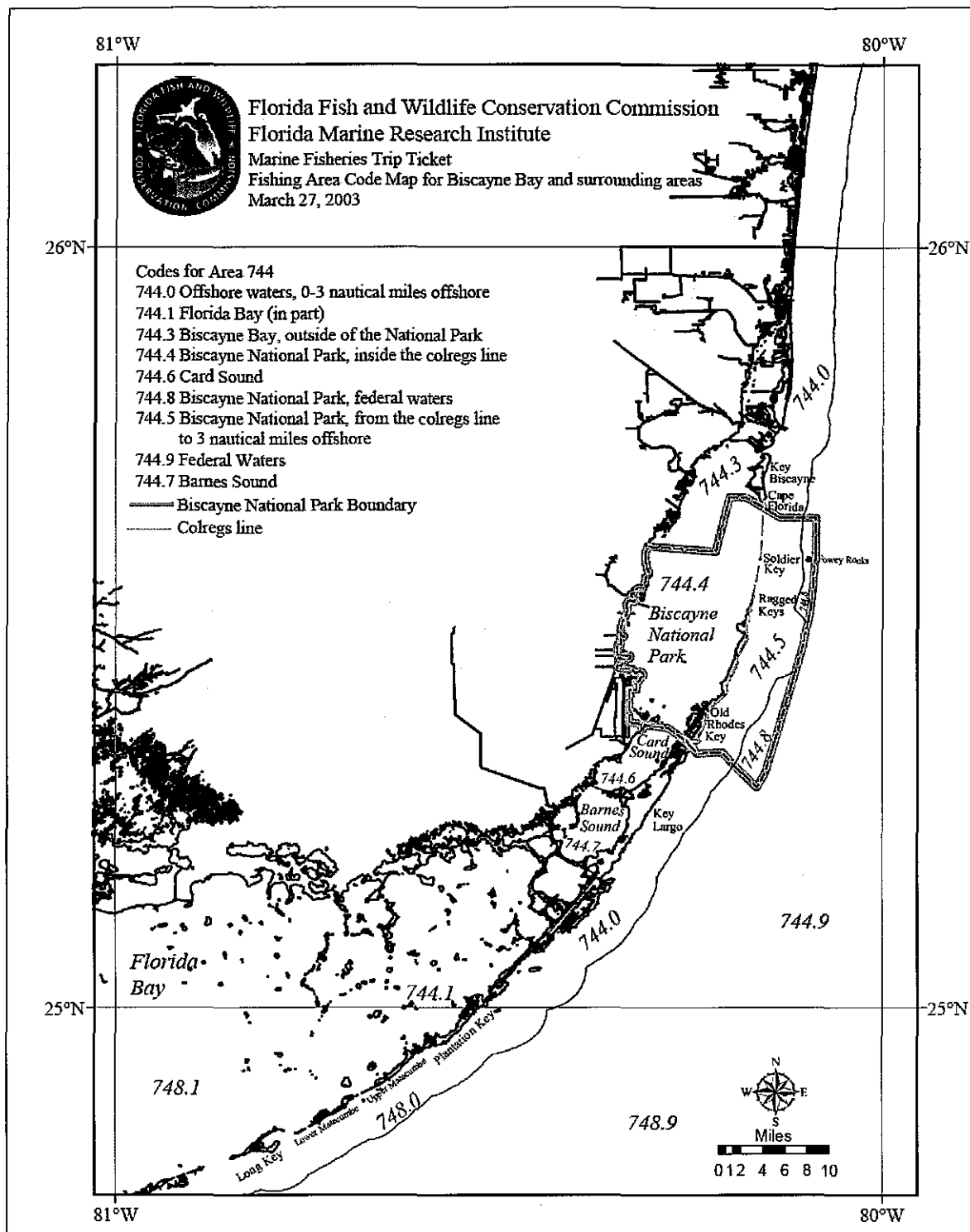


Figure 16
Fishing Area Code Map

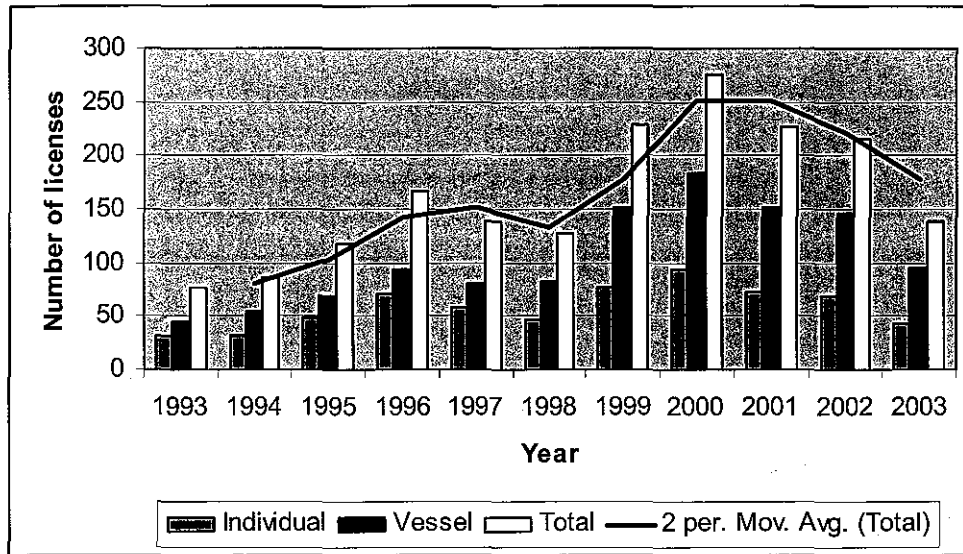


Figure 17 Saltwater Product Licenses, Biscayne Bay, 1993-2003

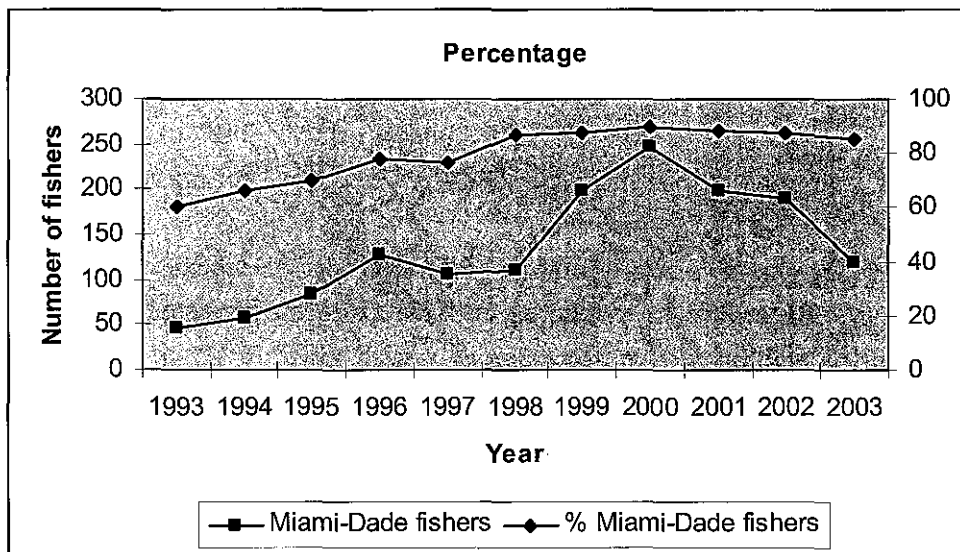


Figure 18 Number and Percentage of Miami-Dade SPL Holders in Biscayne Bay, 1993-2003

As shown in Figure 19, the number of SPL holders has declined 34.1 percent in Monroe County from 1996 to 2002 and almost 30 percent (29.6 percent) for the rest of the State of Florida. In Miami-Dade County, which contains a majority of the Biscayne Bay fishers, there were 1,338 SPL holders in 1993-1994. For the most recent year, 2004-2005, there are 836 SPL holders. This represents a contraction of over a third (38.2 percent) of all fishers who reside in Miami-Dade County.

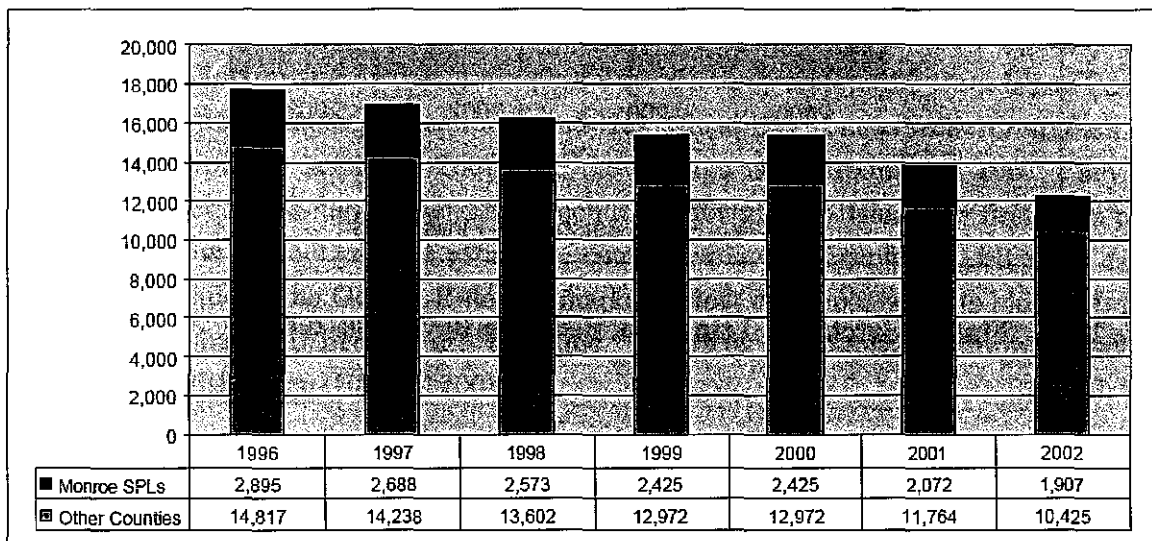


Figure 19 Biscayne Bay SPL Holders, Monroe and Other Counties, 1996-2002

Finfish landings in the Biscayne Bay reporting area (including a limited offshore area outside of the bay itself) dropped from 102,402 pounds in 2000, to 45,301 pounds in 2001, to 31,001 pounds in 2002, as shown in Figure 20. Preliminary 2003 data suggest a rebound in finfish catch (43,714 pounds through October 2003), resulting mainly from higher baitfish landings. Similarly, trips taken were highest in 2000, followed by steady declines until 2003. While the amount of catch per trip dropped from 2000 to 2001, the value per trip increased during the same time period as shown in Figure 21. This is due mainly to the types of finfish caught in the 2 years. In 2000, finfish catch was dominated by ballyhoo, a relatively low valued species. In 2001, the amount of snapper landed increased considerably, and because this species fetches a higher ex-vessel value, the average value per trip increased while overall landings decreased, from 2000-2001.

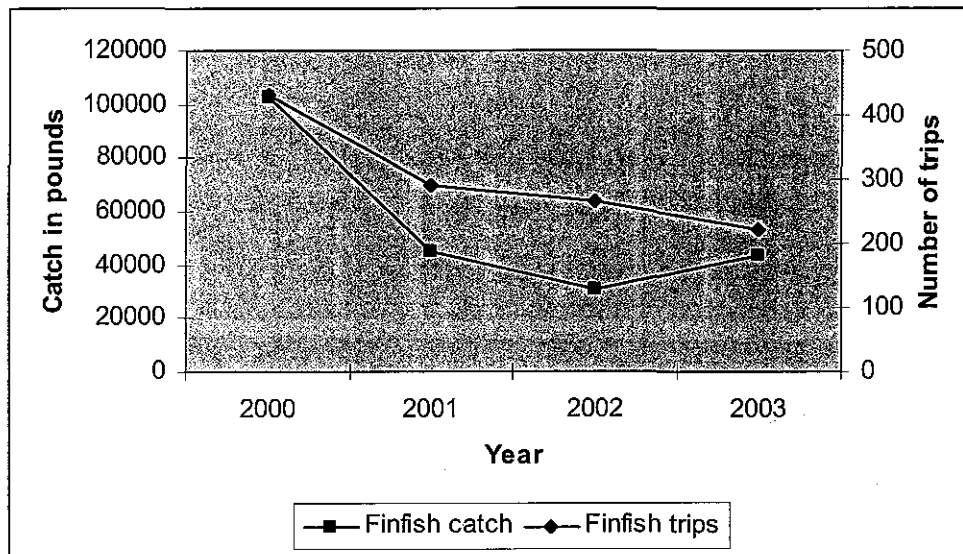


Figure 20 Finfish Catch and Trip Data, Biscayne Bay, 2000-2003

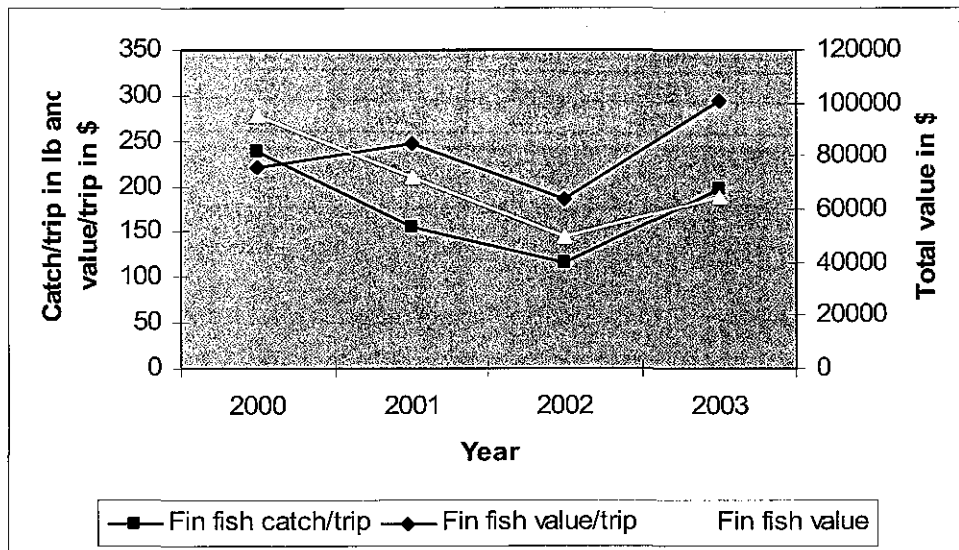


Figure 21 Finfish Effort and Value Data, Biscayne Bay, 2000-2003

Blue crabs have no season and can be caught year-round. The blue crab fishery dates back to the late 1800s in Florida, but it was not until the 1950s that the current gear type – wire traps – began to dominate the fishery. Landings have remained low for Biscayne Bay compared to other regions. Ault et al. (1997) found that blue crabs are mostly targeted in the southern parts of the bay and park, and that the traps are located almost exclusively on seagrasses in the southwestern shoreline between Black Point Marina and Turkey Point Power Plant.

Earlier research (EDAW 2003) characterized the blue crab fishery within Biscayne National Park as limited, with perhaps only 10 or 20 participants in park waters. Blue crab fishermen use skiffs in the 15- to 20-foot range, powered by outboard motors. These small craft are typically kept on trailers. Most blue crab fishermen who use park waters launch their skiffs from Black Point, but some may launch from Matheson Hammock and Homestead Bayfront as well. From their skiffs, these fishermen typically set 80 to 200 traps; the average is approximately 100. They might retrieve one-quarter to one-half of their traps each time they go out. Blue crab fishermen operate in shallow water in the vicinity of estuaries, canals, etc. They typically sell their catch to fishmarkets, particularly the Golden Rule Fishmarket. Most participants in the blue crab fishery are part time; perhaps 30 percent are full time. There is apparently no formal association representing crab fishermen (EDAW 2003).

The figures concerning the Biscayne Bay blue crab fishery from 2000 to 2003 show that the past few years have witnessed a decline in catch and effort as shown in Figures 22 and 23. From a high of almost 190,000 pounds landed in 2000, catch has declined to less than 74,000 in 2002 (the 2003 total is even lower, but it is based on incomplete data). It appears that fishers may have anticipated an equal or better season in 2001 than they experienced in 2000, as evidenced by the higher number of trips taken in that year. The overall effect of increased effort has been decreased catch per trip, from 167 pounds per trip in 2000 to less than 75 pounds per trip in 2002. Moreover, although ex-vessel value has increased from \$1.21/pound in 2000 to \$1.43/pound in 2002, the average value per trip has decreased; thus, fishers have been unable to make up for lower catches with higher sale prices, as each trip has been less profitable (and this does not take into account other rates of inflation, especially fuel costs).

Stone crabs are landed from October 15 to May 15 (FAC 68B-13.005). Like spiny lobster, stone crabs are caught in wood slate-traps, and this fishery is subject to a certificate program (Florida Statute 370.13), starting in the 2000-2001 season. However, unlike spiny lobsters, which are harvested whole, it is illegal to harvest whole stone crabs; instead, only legal-sized claws are removed, and the invertebrate is released. As noted by Ault et al. (2001), there is “sparse literature” on the stone crab fishery in the bay.

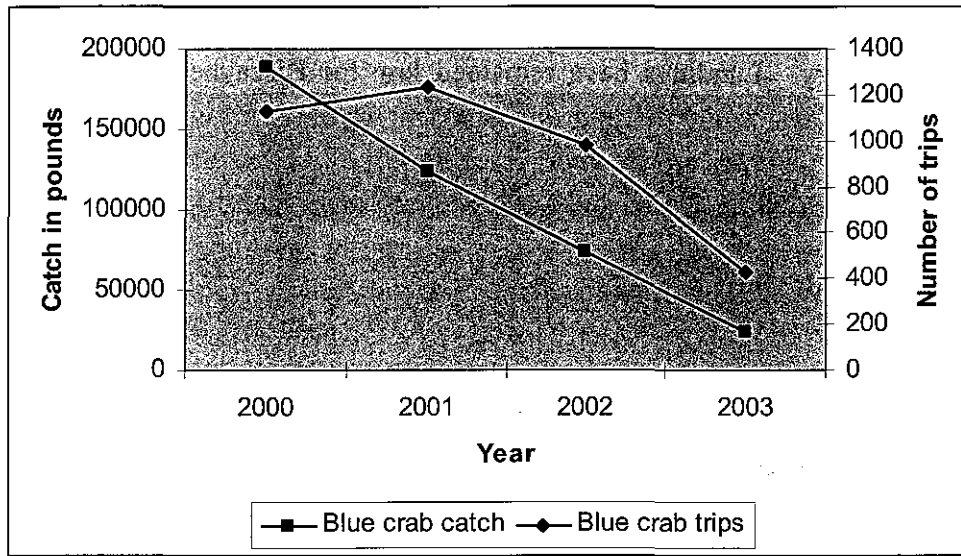


Figure 22 Blue Crab Catch and Trip Data, Biscayne Bay, 2000-2003

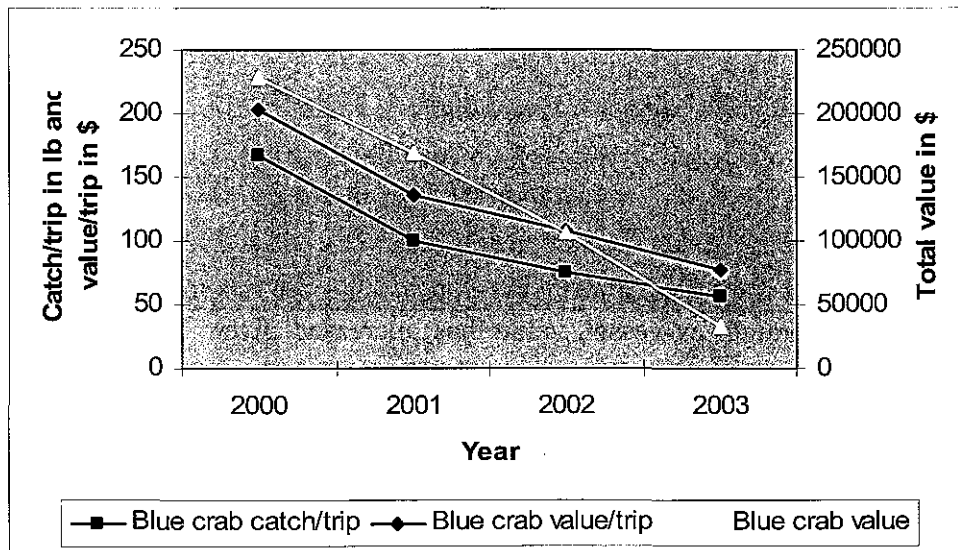


Figure 23 Blue Crab Effort and Value Data, Biscayne Bay, 2000-2003

Earlier research (EDAW 2003) characterized the stone crab fishery within Biscayne National Park as somewhat similar to the blue crab fishery, with some blue crab fishermen also pursuing the stone crab fishery. Stone crab traps are much heavier (approximately 40 pounds), and this necessitates use of a larger boat. Most stone crab fishermen are full time because the permit/certificate system is based on yearly catch, which places part-time fishermen at a disadvantage. The pattern among some stone crab fishermen is to fish inside the park early in the season, then in the Key Largo area. Others work the Black Point area for the whole season. The catch is sold to local fish houses, e.g., the Golden Rule Fishmarket and the Key Largo Fisheries (EDAW 2003).

Stone crab landings decreased 41 percent from 2000 (7,757 pounds) to 2001 (4,565 pounds), as shown in Figure 24. However, the landings picked up in the next 2 years, with 2003 reaching 7,905 pounds even without counting the last month of the year. This information was further corroborated by the individual fishers (see next section), who noted that while the blue crab fishery had declined significantly, the stone crab fishery had improved since 2003. Neither statewide nor Miami-Dade County landings followed this trend, as catches for the state actually decreased in 2003 (from 3.43 million pounds in 2000 to 2.66 million pounds in 2003), and Miami-Dade County landings reached 114,000 pounds in 2002 before decreasing to 94,000 pounds in 2003. Therefore, local catch totals did not mirror regional or statewide trends.

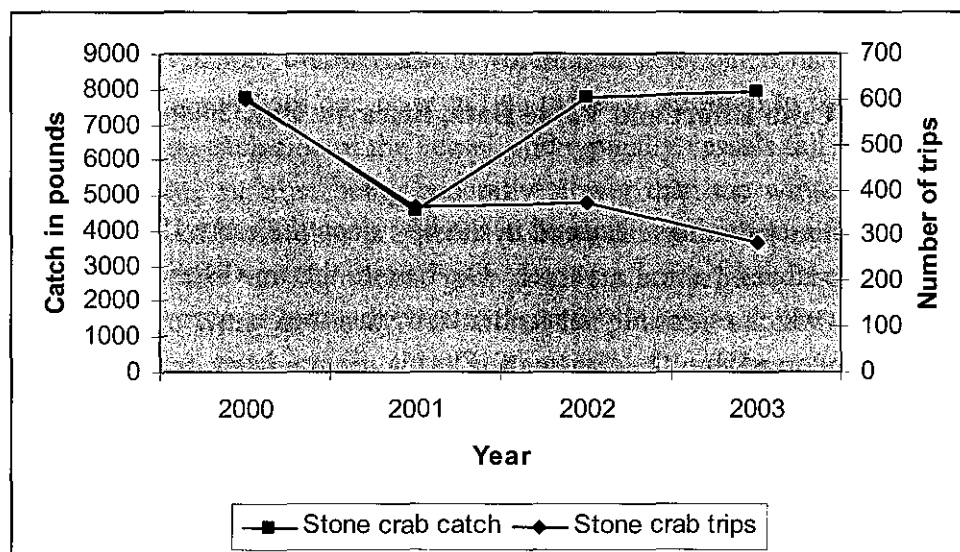


Figure 24 Stone Crab Catch and Trip Data, Biscayne Bay, 2000-2003

In Biscayne Bay, catch per trip and value per trip both increased after the 2001 season; in fact, catch per trip in both 2000 and 2001 was 13 pounds/trip and 12.5 pounds/trip, respectively; in the subsequent 2 years, catch per trip averaged 24.2 pounds/trip, as shown in Figure 25. Interestingly, while the average value per pound of stone crab claws decreased from 2000 onwards, the value per trip increased. In 2000, fishers landed higher percentages of jumbo and large stone crab claws, which attract higher ex-vessel values; but, because fishers increased their catch-per-unit-effort in 2002 and 2003, they earned more per trip than in 2000 or 2001.

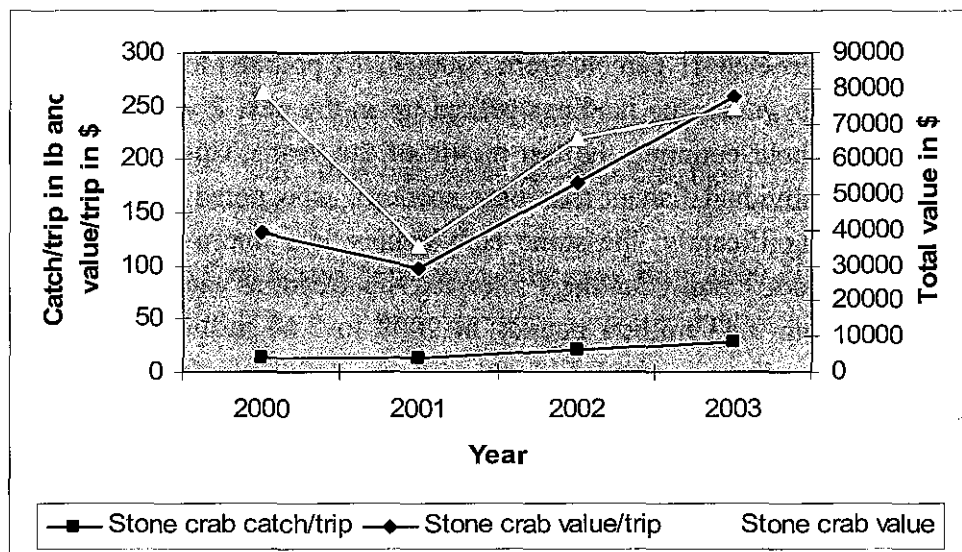


Figure 25 Stone Crab Effort and Value Data, Biscayne Bay, 2000-2003

Bait shrimping, an activity that has occurred in the bay since the early 1950s (Seidenfeld 1999), utilizes a trawl that is towed behind a vessel. Over time, the trawl has been modified into the so-called rollerframe (which essentially is a roller trawl that moves over seagrass). Although the system has been endorsed by the State of Florida, there have been studies implicating rollerframes for impacts to sponges and hard and soft corals (Ault et al. 1997; Tilmant 1979). While the number of vessels in the fishery increased since its inception, reaching a maximum of 46 boats in 1986, that total has decreased to a dozen or more boats currently. Unlike in the crab and lobster fisheries, effort in the bait shrimp fishery generally emanates from Dinner Key and Black Point Marinas (from the central bay). The vessels work year-round and can sweep the shallow (4 to 6 feet) bay bottom up to four times per year (Ault et al. 1997).

A general description of the bait shrimp fishery within the park may be found in the Ethnographic Overview and Assessment (EDAW 2003), which noted that it has been described as the most intense commercial fishery use of the park. Especially in the summertime, the vessels work the western side of the bay in the grasses relatively close to the mainland shore. The vessels that use the park are concentrated in Black Point and Dinner Key, although there are also one or two vessels in the Card Sound area that use park waters. The largest single concentration is at Black Point, with perhaps 12 or 13 vessels operating out of that marina, and all of these vessels operate as full-time commercial operations. At least one vessel owner owns multiple vessels in this fishery. Although the fishery has some historical depth, earlier interview data suggest that only a very few of the current participants have fished it for more than a decade (EDAW 2003). Unlike the food shrimp fishery, the bait shrimp fishery has no closed season and is reportedly pursued 7 days a week, year-round. Markets for the shrimp caught in this fishery are bait and tackle stores, and catch is typically "pre-sold" through existing supply agreements. The stores supplied with bait from Biscayne Bay range from Key West to well north of Miami, and stores may buy from more than one fishing operation to hedge against a drop in performance from any one operation. Trawl tows are typically 15 to 30 minutes in duration, with catch retained in tanks on board after being sorted on picking trays to allow for the release of bycatch species. The financial return on effort varies significantly during the year as, according to one owner, "you make money in the winter, and [just] pay the bills in the summer." With the hydraulic system on board reducing physical labor demands, a number of these vessels are run at least part of the time by just the captain, but even on these operations typically a mate is added in the winter time to help handle the increase in volume, at least when fishing on the weekends. Other vessels commonly run with one or even two mates in addition to the captain on a regular basis. One trawl is set on each side of the vessel, and typically vessels fall into the 27- to 32-foot range. In addition to the summer being generally slower than the winter, the period between Labor Day and the start of November is especially slow, as is a 2-week period around Christmas. Interview data suggest that no significant gear conflicts are reported between shrimpers and crabbers, both of whom work in Biscayne National Park waters out of Black Point, but in the past some conflicts occurred between local shrimpers and longliners working out of Miami (EDAW 2003).

Bait shrimp catch in Biscayne Bay was stable between 2000 and 2002, as shown in Figure 26. Landings for Biscayne Bay from 2000 to 2002 averaged over 362,000 pounds per year. However, 2003 was a poor year. Although the data for 2003 were not complete, the catch per trip in 2003 was lower than that for any of the other years. Moreover, Miami-Dade County landings for 2003 reported a total of 193,765 pounds of bait shrimp for the entire year, harvested from 3,613 trips. This would equate to a trip average of 53.6 pounds per trip, considerably lower

than the 110 pounds per trip reported for 2000, and the average 77.5 pounds per trip for the 2000-02 seasons. More recent, preliminary data for Miami Dade County suggest that catches may have rebounded. The preliminary 2004 dataset for the county reported bait shrimp landings of 256,550 pounds harvested over 3,144 trips (or 81.6 pounds per trip), representing an increase of 32.4 percent over the past year. However, the 2004 landings still remain well under the 2000 to 2002 totals.

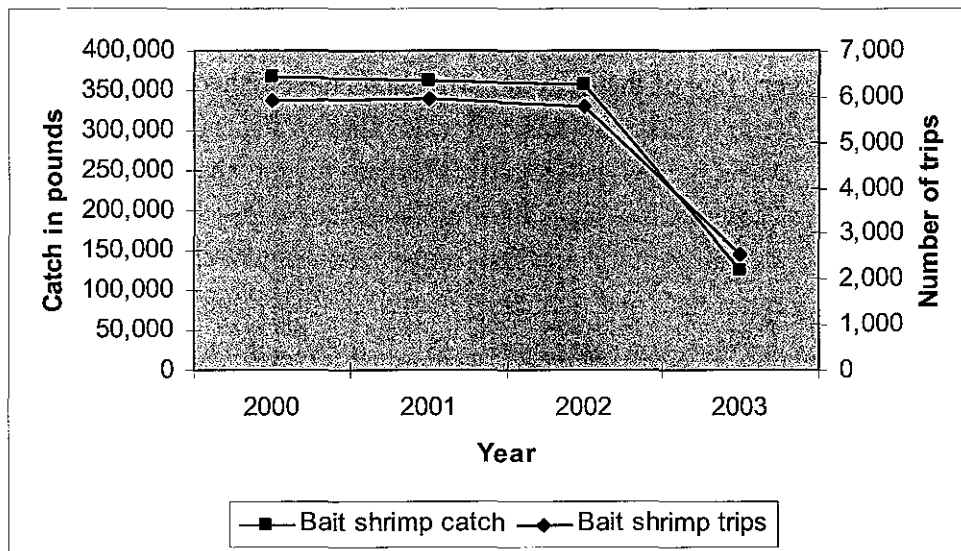


Figure 26 Bait Shrimp Catch and Trip Data, Biscayne Bay, 2000-2003

As catches in the bait shrimp fishery have declined, so has effort, as shown in Figure 27. For 2000, fishers reported a total of 5,885 trips. While they took a similar number of trips in 2001 (5,969 trips) and 2002 (5,782 trips), they reduced effort by over 2,800 trips in 2003 (3,613 trips) and over 3,200 trips in 2004 (3,144 trips), compared to the 2000 season. This occurred as the average price of bait shrimp increased. Ex-vessel value per trip was \$2.87 (for the state) in 2000, compared to \$3.41 in 2001, \$3.80 in 2002, \$3.20 (for the state) in 2003, and \$3.38 (for the state) in 2004. The overall effect has been that the total performance of the fishery has not declined to the extent that catch has been reduced over the past few years. In 2000, the 368,654 pounds of bait shrimp accounted for \$1,058,037 in ex-vessel value. Two years later, in 2002, the catch totaled 357,106 pounds; however, the ex-vessel value was \$1,358,436, which amounted to an increase in value by 28.4 percent. Therefore, unlike in the blue crab fishery, where prices did not rise at the same time local harvests decreased, prices have risen at the same time that local harvest levels of bait shrimp have decreased. This rough comparison, however, is complicated by

a number of factors. According to interviews with crab fishermen working in the area, local blue crab catch volume is very small in relation to central and north Florida catch volumes and thus local catch has little or no impact on common marketplace prices. Second, price structure in the bait shrimp fishery may be influenced to a greater or lesser degree by the market system of pre-placed orders from bait shops, where demand and harvest level relationships may vary in a somewhat different manner than the relationship seen in direct-consumption driven markets. These variations, however, would appear to more directly influence harvest volumes rather than price in the local bait shrimp fishery.

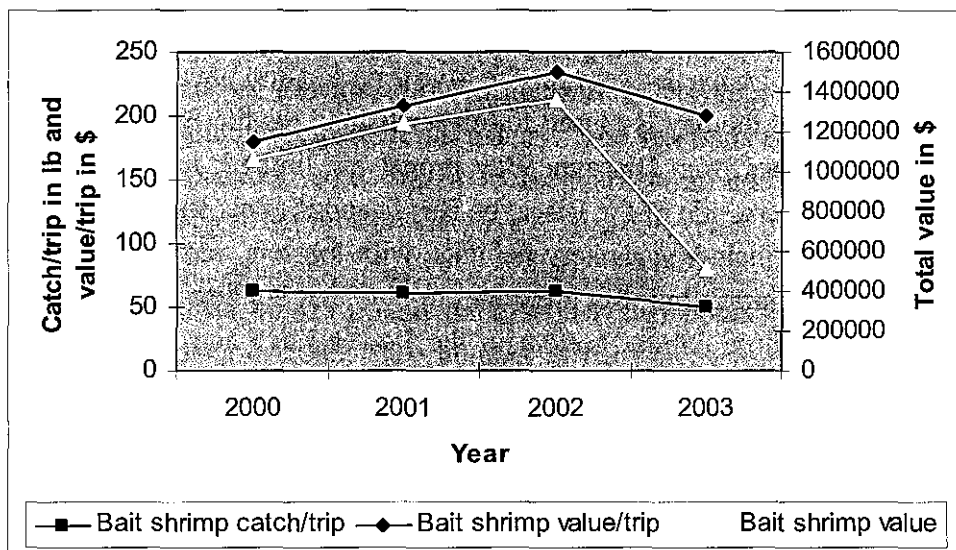


Figure 27 Bait Shrimp Effort and Value Data, Biscayne Bay, 2000-2003

Finally, other species not described in greater detail here were nevertheless reported for the Biscayne Bay statistical area (including the offshore portions of this area), including spiny lobster and food shrimp. Spiny lobster is landed from the first week of August to the last week in March, although the recreational season commences a week prior to the commercial season (FAC 68B 24.005). The predominant gear type in the fishery is the aforementioned wood slate-trap, and the number of traps is strictly controlled under a market-based certificate program (Shivlani and Milon 2000). The only other ways that fishermen can commercially harvest spiny lobster are by diving for the species and by using a bullynet. Spiny lobster fishing is allowed in portions of Biscayne Bay itself (north of Biscayne National Park) as well as in Barnes Sound; however, under FAC 68B-11, no lobster fishing is allowed in the Biscayne Bay-Card Sound Lobster Sanctuary. Spiny lobster is not a very important commercial species in the bay;

however, it does represent a vestige of the region's past history and it remains important for the few fishermen who trap in the lower parts of the bay, including Card Sound and Barnes Sound as well as in the offshore areas of Biscayne National Park. The offshore area of the park is heavily targeted for lobster, but it is difficult to quantify how much is landed specifically from the park itself. Spiny lobster are targeted in a variety of habitats, but traps are usually set on seagrasses or hard bottoms (near coral and patch reefs). Ault et al. (1997) found that over half of the traps they observed in the park were located on seagrass, a third on patch reefs, and 14 percent on bare substrate.

Spiny lobster accounted for a small portion of the region's total catch, averaging just over 4,045 pounds per year from 2000-2003. The number of trips taken per year in the fishery was also quite modest, averaging 27 trips per year for the 4-year period and never exceeding 30 trips in a season. Because much of the bay is closed to lobster fishing (as the Biscayne Bay-Card Sound Lobster Sanctuary), catches from Biscayne Bay proper are limited; instead, almost all lobster fishing occurs on the eastern side of the Biscayne Bay islands. (This would be expected to some degree based on the bay including nursery habitats, with lobsters making ontogenetic shifts to ocean side (reef) adult habitats, but it is important to note that landings are commonly taken off seagrass and other nearshore habitat bottom in the Lower Keys and even part of the Middle Keys.)

Fishers also reported landing food shrimp, which in some years was a large portion of the region's overall catch. However, based on previous research (Shivlani 2002) and present findings, it is clear that most of that catch is from outside the Biscayne National Park boundaries. Food shrimping is conducted primarily by wingnetters, so-called due to the appearance of their fishing vessels that skim nets on either side. The technique is relatively new (having been developed two decades ago), and it only utilizes the upper level of the water. Therefore, wingnetters cannot and do not net in water shallower than 4 to 6 feet, effectively segregating them from grounds used by bait shrimpers (Regina Lopez, personal communication, 2000). Seidenfeld (1999) reports that wingnetters primarily fish from the Venetian Causeway in the upper bay to the Rickenbacker Causeway in the central Miami-Dade region. Subject to a closed season, the food shrimpers do not typically use the park; they may enter the northern boundaries of the park in the area around Stiltsville but usually fish the mid and upper bay (Regina Lopez, personal communication, 2000).

A general description of the wingnet fishery in the area may be found in the Ethnographic Overview and Assessment (EDAW 2003). This fishery is characterized as being pursued out of skiffs 25 to 30 feet long that are powered by outboard motors. These skiffs are mounted on

trailers and most launch at Crandon Marina and other points north of the park. The wingnet boats have a framework that supports a dip net on each side of the vessel. The framework is lowered into the water, and the boat powers slowly into the schools of shrimp as they rise to the surface. The wingnetters typically work areas around estuaries, canals, and bridges. The best time for wingnetting is reported to be during strong winds, especially northerners, because shrimp leave the bottom during these conditions and rise in the water column. When not on a set, the nets extend on each side of the skiff like wings, hence the name wingnet. Wingnet shrimpers typically work at night, one or two people to a boat. Most are men, but some women also participate, and a few women have their own vessels. Virtually all wingnet shrimpers are of Cuban descent. The fishery is a relatively recent development and the wingnet apparatus as locally configured was reportedly invented by a Cuban expatriate some 25 to 30 years ago. Ages of participants vary from the 20s to the 60s. An organization was formed around 2000 called The Wingnet Shrimpers of Florida. The organization has approximately 95 members, but approximately 500 people participate in the fishery. The season is now limited to 6 months. All the catch goes to fishpackers, who ship it to fishmarkets around the country. The wingnet organization is attempting to set up a cooperative to distribute their own product (EDAW 2003).

Food shrimp accounted for 40,411 pounds in 2000, 187,361 pounds in 2001, 187,361 pounds in 2002, and 245,964 pounds in 2003. The number of trips taken for food shrimp increased from 159 trips in 2000 to 789 trips in 2003, representing an increase of almost 500 percent.

Sponging was allowed in Biscayne National Park until 1991, when the Florida Marine Fisheries Commission (MFC) closed the fishery (FAC 68B-28.004). Traditionally, sponging was an artisanal activity in the bay until a 1980s sponge die-off in the Mediterranean inflated world prices and prompted increased effort and participation in the Florida fishery. Under these circumstances, the National Park Service requested that the MFC close the fishery (Diresta, Lockwood, and Curry 1995). Sponging is still allowed in other parts of Florida, but there are regulations on gear, size, and areas. Spongers may not dive for sponges in most State waters, and they can only use standardized gear and fish a minimum size (Florida Statutes 370.17). In the Biscayne Bay area, spongers only use Barnes Sound and Card Sound, avoiding the central and upper bay (Jose Ordonez, personal communication, 2000). Since the 1991 closure, there have been numerous reports of spongers illegally harvesting sponges in Biscayne National Park. Illegal harvesters who have been caught have been banned from the park for all activities (Bernstein 2000); however, reports of such harvests continue.

Ethnographic Information

Ethnographic Interview Methodology

As well as existing literature and secondary data review and geographic information analysis based on existing layers, the methodology adopted called for the completion of open-ended interviews with two members of each key fishery sector, in part to calibrate secondary data available for Biscayne Bay to the Biscayne National Park-specific context. The interviews were to be ethnographic in nature and thus focused on qualitative data collection conducted in the field with commercial fishers and recreational fishing guides and charter operators. The interviews were driven only broadly by guiding questions, as the main goal was to elicit issues of interest (including environmental, social, economic, and cultural issues) from the respondents to supplement existing quantitative data that would be used to characterize fisheries and links to the local communities and economies.

The commercial sectors initially targeted were crustacean fisheries, consisting of blue crab, stone crab, and spiny lobster; and finfish fisheries, consisting of the snapper-grouper, or reef fish, complex. Additional interviews were planned with fish house owners and for-hire fishing operations, the latter of which was comprised of flats guides and charterboat operators. Following an initial round of interviews, it was determined that roller trawl shrimp fishers would be added to the list of commercial crustacean fishers, as the sector did operate within Biscayne National Park and was an issue of concern to other fishing sectors. Also, commercial spear fishers, who also operate within Biscayne National Park waters, were contacted. No interviews were initially planned with recreational fishers outside of contacting any relevant local groups that were identified during field efforts.

The ethnographic information collected from commercial fishers, fish processors, and for-hire operators was based largely on open-ended conversations held with respondents. However, to facilitate information exchange and to obtain information of relevance to the study, a series of guiding prompts were used. The topics developed are presented below.

1. *Use of Biscayne National Park*
2. *Trends of fisheries in the park and the environs*
3. *Identification and ranking of stressors*

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4. *General economic and use information, of the park*
 - a. *Investments, costs, and returns*
 - b. *Location from where goods and services are purchased (local community?)*
 - c. *Numbers of persons employed*
 - d. *Numbers of operators*
 5. *Linkages to the community*
 - a. *Points from where trips are taken (i.e., trailers vs. docks)*
 - b. *Changes over the number of users over time*
 - c. *"Traditional" use vs. business use*
 - d. *Generational ties*
 6. *Identification of conflicts (inter- and intra-group conflicts)*
 7. *Views on current management and future management plan*
 - a. *Views on closures, zoning*
 - b. *Views on limited entry, carrying capacity*
 - c. *Views on fishery management*

While these topics were used, respondents were allowed to provide as much information as they deemed necessary, even if it were not directly related to the study. Thus, on average, each interview ended up lasting slightly longer than an hour. Finally, participants were encouraged to indicate the areas where they (and more importantly, the fishery they represent) operate. Using this participatory mapping approach, a series of fishery-specific maps was generated. While the maps may not include *all* areas of use for a particular fishery, they do provide broad spatial information for fishery uses within Biscayne National Park.

Ethnographic Findings

A total of 24 interviews were completed for this effort, and these included fish house operators (4), fishing guides (3), charter captains (2), net, bait fishers (2), bait shrimpers (2), stone crab trap fishers (4), spiny lobster trap fishers (2), blue crab trap fishers (2), spear fishers and divers (2), and a recreational fishing group representative. Information provided is mainly in narrative format, with quotes attributed to 1 of the 24 interviews, and results provided for the following industries/fisheries: guide operations; charter fishing operations; trap fisheries; hook-and-line and spear fisheries; and bait fish and bait shrimp net fisheries. Additional discussion is provided on fish houses and recreational fishing groups.

Fishing Guides

The park's fisheries are very diverse and thus encompass a diversity of user types. However, it is also clear from the interview results that resources in the park have either been historically low or are depleted; thus, the number of each user type is generally low. The exception to this is flats guides, who tend to use Biscayne National Park, Everglades National Park, and the Upper Keys's nearshore waters extensively.

Of the three guides interviewed, each reported using much of the park for their activities. Use of the park ranged from as low as 50 percent to as high as 90 percent, but all the guides agreed that the park is essential to the local guides (of which current interviewees estimated there are as many as 75, while other estimates [EDAW 2003] placed this number closer to 50). Guides tend to use shallow watercraft that is both inexpensive and maneuverable in water 6 feet or less in depth. While they can and do use a variety of habitats, guides tend to work mainly on seagrass. They rely on clear water and quiet conditions, as the species they target (bonefish, tarpon, permit, sharks, etc.) are located mainly by sight and caught in shallow water. The species of concern require quiet conditions as well, such that boat traffic is detrimental to the fishing experience. For the guides, their fisheries were and remain in excellent condition, primarily because they release a large majority of, if not every fish that they capture. When asked about mortality rates of returned fish, one of the respondents stated that guides are very conscientious of returning fish alive and will nurse the fish back. They understand that their livelihood depends on the abundance of their target species and would take every precaution to ensure that the resource is not depleted.

The main stressors identified by the guides were those related to user conflicts and to water quality. All of the guides interviewed argued that recreational boaters were negatively impacting the park, primarily due to their aforementioned lack of knowledge. One guide added that in the case of personal watercraft (PWC), the ban is completely justified. The PWC users (now banned from the park), in one guide's opinion, exemplify the recreational boating industry, which tends to be careless, selfish, and inexperienced. They, more than all the other user groups in the park, tend to tear up seagrass and generate other boating impacts, don't care about other users (especially guides), and generally do not know how to react to groundings. Also, at least according to one guide, recreational fishers more than their commercial counterparts compete with guides in landing the same species. This presents a long-term problem as many recreational fishers tend not to return the fish landed, and their overall numbers lead to withdrawals of huge numbers of fish from the park and surrounding areas. Some of the guides reported other problems as well, including one guide's contention that the bait shrimp fishery is affecting all

commercial catches, including those fish targeted by guides. This person's contention is that because bait shrimp fishers tend to harvest bait-sized shrimp in the north of the bay, there is less food for commercially important species, including flats caught fish.

With respect to water quality, all the guides interviewed pointed to the pollution entering the bay from the mainland via sundry, point and non-point sources. They did not point to any particular source as did users from other groups (usually referring to "Mount Trashmore," the local landfill), but there was consensus among the respondents that water quality and clarity conditions had deteriorated in parts of the park. Pollution thus was a very important issue, as it affects the very conditions on which guides rely for a livelihood.

Guides' investments, as according to the respondents, are modest compared to the investments required in other fisheries. The boats used are small (20 feet or less in length), made of lightweight material, and have a very shallow draft. Almost all guides in the area tend to trailer their boats (and many live in the same part of South Miami-Dade) than leave them docked at a marina. Thus, there is no single point of entry into the bay, and the ramp used depends on that day's fishing activities. Guides use Matheson Hammock, Bayfront Park, and ramps in the Upper Keys, as well as those in Everglades National Park.

Guides invariably operate alone, with only clients sharing the boat. Costs per trip range depending on the client (if he or she is a repeat customer, etc.), and the guides tend to be quite busy, especially during the winter season. One of the guides stated that the amount of work that a guide obtains depends on the guide's experience and reputation, both of which increase over time. A guide in the highest tier can be busy throughout the year, taking bookings from all over the United States (as most clients tend to be visitors who take one or more backcountry fishing trips during their stay).

While the study could not identify direct economic linkages between guides and the local community (especially because of the clientele being mainly non-local), it was notable that most guides working the lower bay and Biscayne National Park live in the western Homestead area. One of the guides interviewed identified several other guides living in the vicinity, stating that their proximity is a result of the area's centrality (between Biscayne National Park to the east, Everglades National Park to the southwest, and the Upper Keys to the south). Apart from contributing to the local economy as residents, guides also purchase most of their fishery gear and products from local stores.

In terms of conflicts, all of the guides interviewed complained about (mainly recreational) boat traffic, which negatively impacts their business. They argued that recreational fishers had a poor understanding of tide conditions and tended to get their boats caught on the bottom. To make matters worse, one of the guides stated that the recreational boaters are poor operators, causing significant propeller scars across the bay. Other recreational users tend to congregate on sandbars during weekends, where their activities interfere with those of the guides and damage important benthic habitats. Other commercial users did not present a direct conflict. For example, bait shrimpers work at night, so they do not interfere with guides' activities. Trappers have fixed gear around which guides can and do maneuver their craft. Hook-and-line fishers and spear fishers operate in the ocean side of the park and thus are spatially separated from the flats guides. However, as stated by the guides, because of the quantities of small fish and invertebrates removed by fishers (especially bait fishers and bait shrimp fishers), there is less food for their target species.

Notwithstanding the stressors and inter-fishery conflicts, guides remained ambivalent to changes in fishery management. As stated by one of the guides, it is clear that management can work, but given previous experience with the county, management success cannot be guaranteed. Similarly, another guide believed that the management measures in place currently would work efficiently if only the measures were enforced sufficiently. He pointed to the abuse suffered by the sand bar area west of Sand Key by recreational users, which he claims occurs unabated even though there are regulations against such resource damage. Therefore, this guide argued that Biscayne National Park and the State of Florida first need to demonstrate how each will enforce current regulations before his industry would accede to new laws.

Guides in general appeared to be in favor of no-take or other zoned areas, arguing in favor of non-motorized zones that would assist their occupation. One agreed that while marking channels may be perceived as a form of zoning and is an eyesore in the water, he would favor such changes if they improved the environment. Another believed that the patch reefs in the park and around Elliot Key in particular have been overfished and damaged by commercial net fishers and recreational divers alike, and that zoning may present a meaningful approach to protect these areas. However, a guide (like many of the other user groups interviewed) remained wary of what they believe is additional bureaucracy and thus were mostly averse to changes in management.

Charterboat Operators

The charterboat industry has been characterized for Miami-Dade and adjacent, northern counties in a study funded by the University of Miami's Center for Sustainable Fisheries (Die et al. 2003).

The information gathered from that study, as well as a list generated of potential Biscayne National Park fishers (Brinson, personal communication), served as the population from which respondents were selected for the ethnographic interviews.

Most local charterboat operations do not rely on Biscayne National Park for many of their activities. In fact, as related by operators in this study, the use of the park is restricted primarily to casting for baitfish around the islands in the park and then boating through the park into deeper waters. Most charterboat fishing takes place at 60 feet or deeper, so there might be some of the outer reefs used by the industry. However, that use is variable (depending on weather conditions and fish availability, mainly); thus, as reported by the operators, the Biscayne National Park reefs are not directly essential to their fishing activities. This does not mean that the respondents qualified the area as not important to their activities. They rely on baitfish that is caught mainly in the park, and if areas were closed or zoned, they would need to take longer trips to find bait.

Fisheries in the park have remained stable, according to charterboat operators. There is no evidence of overfishing in the park, and other commercial fisheries appear to be doing well. Respondents believed that recreational users also have little impact in Biscayne National Park, as summer use is low and winter use is limited. Overall, charterboat operators believed that their group has the least impact on park resources, as it tends to fish the farthest from the park and extract only the amounts allowed, and only a few operators sell their fish commercially. Moreover, charterboats also fish different resources than are targeted by most other groups, as a majority of their trips target pelagic species, including dolphin, wahoo, marlin and other billfish, and tuna (in depths of water well over 100 feet).

Charterboats have large operations, compared to the fishing guides, the other for-hire industry. Vessel costs represent the highest investment cost, exceeding \$100,000 in many cases, and docking fees and vessel maintenance rank as the highest annual expenses. Docking slips, which are less expensive in southern Miami-Dade than in places like Coconut Grove (Dinner Key Marina) and Miami Beach, nevertheless can comprise a large percentage of monthly expenses. As stated by one of the respondents, the additional factor that has dampened business and increased operation costs has been surging energy costs. It has become more expensive for visitors to reach Miami-Dade, and charterboat costs have increased with fuel costs. Added to these cost concerns within the industry are higher insurance premiums, which tend to increase with each hurricane season. As variable costs increase, operators foresee only two options: The first is to increase their fishing trip fees (mainly to offset fuel costs); and the second is to leave the industry, which it appears that several operators have considered.

Economic ties to the local community – which range from docking and related fees, the purchase of fuel and other supplies, and expenses incurred as residents in nearby homes – were similar to those reported for the fishing guides. Also, like the guides, most of the clientele to which charterboat operations cater is non-local. The only other economic linkage reported for the industry is the occasional, retail sale of small amounts of fish (in locations such as Crandon Park Marina on Key Biscayne⁴). Charterboat operators did not quantify the changes in the number of users over time, but they believed that not many changes had occurred in the number of Biscayne National Park charterboats, especially since not many operators use the area anyway. Due to the rising costs and increased restrictions, they argued that the number of local operators may very well decline in the near future.

Respondents did not identify any intra-group conflicts, suggesting much as the guides did that charterboat operators tend to space out their effort. Recreational boaters, on the other hand, were blamed for irresponsible behavior. “Visitor” boaters (or those who rent vessels), according to the respondents, are very poorly trained and tend not to obey speed zones or even manatee idle zones in Biscayne National Park and in the bay. Charter operators also felt that commercial fishing affects overall resources available in the bay, including Biscayne National Park. Finally, one of the operators believed that development adjacent to Biscayne Bay is out of control and needs to stop. He felt that its impacts are extremely harmful to both the environment and the residents, but mainly the Everglades ecosystem.

Management does not function in the park or surrounding areas because it is not provided with sufficient enforcement, as stated by the operators. While fishery resources were well protected on paper – such as the lobster sanctuary in the bay – their enforcement was not being well administered. Recreational fishers were identified as the main culprits. Also related to enforcement was the operators’ view that there are double standards for commercial/charter operations and recreational boaters in the area. The latter, by their estimation, are very poorly enforced, as recreational boaters often evade fines even though they speed through manatee zones and other no-wake zones.

When asked whether Biscayne National Park should consider no-take or other zones, charter operators argued that no-take zones would have a negative impact on their industry. These zones would necessitate the operators traveling farther to catch bait fish, resulting in higher fuel costs

⁴ Much of the fish sold from Crandon Park and other Miami-Dade marinas consists of pelagic species, which are themselves mainly comprised of dolphin (Brinson, personal communication). As stated previously, pelagics are caught from outside the Biscayne National Park boundaries; in the case of Crandon Park and more northern marinas, the operator does not even traverse through the park.

and shorter trips. Besides, as stated by one of the respondents, no-fishing zones do not work, and there are already *too many* regulations in place. Another remarked that Biscayne National Park regulations, like those created for other area parks, are only a means by which to generate revenue (i.e., use permits and fees), and that if that is the direction in which Biscayne National Park is going, then the charterboat fishery is going to be pushed further into diseconomy, resulting in the exit of many operators.

Trap Fisheries

The main trap fisheries in Biscayne National Park – blue crab, spiny lobster, and stone crab – are considered together because several users participate in one or more of the three trap fisheries, and they use fixed gear that is fished in a similar manner (that is, the traps in each fishery are baited, placed, and pulled). However, it must also be noted that each fishery contains many differences compared to the others, and these include the depth fished, the benthic environment preferred, and the timing and length of the season, among others. Therefore, these differences will be considered and discussed wherever necessary in describing the trap fisheries.

Of the three trap fisheries, the blue crab fishery hosts the highest percentage of perennial use within Biscayne National Park. Blue crab fishers interviewed stated using the park for up to 95 percent of their landings (landings were also reported north past Matheson Hammock and south into Card Sound). By contrast, spiny lobster and stone crab fishers tend to vary their reliance on Biscayne National Park for their landings.⁵ Over the past 2 years (from 2003-2004), stone crabbers reported that landings had improved from within Biscayne National Park, resulting in greater effort within the park. During that time, many fishers had fished the park almost exclusively for stone crab. Conversely, during the earlier part of the 2000s (2000-2002), effort was much lower than in preceding seasons, and it was spread out farther south (e.g., Barnes and Card Sound). Spiny lobster trap fishers, who are relegated from much of the inner bay, focused their effort from the eastern side of the bay islands to the eastern reefs. Their landings, which were disappointing for 2000-2002, had picked up in the last 2 years. Thus, use of the park had increased since 2003.

⁵ This statement needs further qualification. There are two basic kinds of stone crab and spiny lobster fishers that target Biscayne National Park. There are the Miami-Dade residents who dock at or ramp out of local marinas and who are almost totally dependent on Biscayne Bay in general and Biscayne National Park in particular for landings, and there are the non-residents (from the Upper Florida Keys mainly, but also from northern Miami-Dade and Broward Counties) who use the park on a variable basis, depending primarily on abundance. Thus, when it is stated in the report that there is variable use of BISC, it generally refers to the non-local effort. Local fishers, due to their geographic proximity, small vessels, and limited number of gear (i.e., traps) are less likely to shift effort out of Biscayne National Park.

The areas targeted by each fishery revealed an interesting spatial separation, based primarily on depth, but determined partly by other fisheries and regulations. Blue crab, for instance, is landed almost exclusively from waters less than 6 feet in depth. Thus, traps are placed very close to shore from as far north as Matheson Hammock to Card Sound. There is some indication from respondents that the areas most heavily targeted are not necessarily the most protected. Instead, fishers tend to use areas where there is more boat traffic, reducing the likelihood of poaching (which, in the other secluded areas that may be more productive, is "out of control" and "frustrating").

Stone crab traps are placed in waters between the nearshore waters and the bay islands, although there is some effort on the eastern side of the bay islands as well. Depth, more than bottom type, plays the most important role in selecting fishing areas for stone crab, and 30 feet appears to be the upper limit for stone crab fishing, according to most respondents. Poaching in the stone crab fishery is as urgent a problem as in the blue crab fishery, but respondents believed that just as problematic is the cutting of stone crab gear by bait shrimp trawlers⁶ (discussed in more detail below).

The third and final tier of traps that are placed in Biscayne National Park are spiny lobster traps, which are placed exclusively on the eastern side of the bay islands, due to the Biscayne Bay-Card Sound Lobster Sanctuary. This prohibits lobster fishing on the bay side of Biscayne National Park. The respondents who used spiny lobster traps fished in depths of 30 to 60 feet throughout the ocean side of the park (with the 60-foot depth contour corresponding with the eastern boundary of the park); thus, much of the entire eastern side of Biscayne National Park is used for spiny lobster trap fishing. Additionally, from other work done with spiny lobster fishers in the region (Shivlani et al. 2004), it is clear that spiny lobster traps are fished in waters to the east of the park boundaries to depths greater than 100 feet. So, it is probable that much of the entire eastern side of Biscayne National Park is used for spiny lobster trap fishing.

Trap fishers believed that their target species were largely in good shape. Many pointed to inter-annual fluctuations as evidence for fishery-independent, environmentally driven cycles. Others felt that species abundance is transitory, as most marine organisms tend to move around. The main controlling factor for fishers in the region is weather, which promotes fish and invertebrate migrations and affects catch.

⁶ In fact, because all stone crab fishers interviewed raised this issue, ranking it as the most explosive inter-fishery conflict, it was decided that bait shrimp fishers would be added to the list of fisheries to be characterized. That way, respondents from both fisheries could provide their opinion on the issue.

Many trappers, and especially stone crab fishers, agreed that the main stressor in the park and the bay is the damage caused by bait shrimp trawlers, which they believed tear up the benthos, kill all small fish, and cut trap lines. The other stressor identified by trappers is the deterioration of water quality, which some attribute to the pulsed releases of freshwater from the mainland and the pollution that reaches the bay from the local landfill. Freshwater in such great quantities reduces the salinity in the nearshore bay, affecting catches of all species but especially blue crab. The pollution from the landfill has affected mostly finfish catches in the nearshore environment. Finally, trappers pointed to the gentrification occurring around Miami-Dade waterfronts, stating that such changes would eventually lead to the extinction of commercial fishing in Biscayne National Park and in Biscayne Bay. As one trap fisher related, "this area is dying and they (Black Point Marina) will not rent more to commercial fishers in the future." In their view, as coastal property rates increase, commercial fishing will no longer be able to afford even the most obscure coastal properties. They point to the overall gentrification to Black Point Marina, which first started as a fully commercial marina and now only has one area of slips open to commercial vessels.

Apart from bait shrimp operations, the most expensive fisheries (as determined by capital investment and operating costs) are trap fisheries. Blue crab traps cost an average of \$20, stone crab traps cost an average of \$15, and spiny lobster traps cost an average of \$25. Vessel costs vary, with those fishing blue crab spending the least, as these fishers tend to use skiffs or other flat-bottom boats. Stone crab and spiny lobster fishers use bigger vessels (and especially those operators who enter Biscayne National Park from the north or south) than do blue crab fishers, but there is considerable overlap in vessel size among the trap fisheries due to many fishers' participation in more than one trap fishery. Annual operating costs for trap fishers are usually high, due in part to the expenses related to replacing gear (fishers replace up to 25 percent of their wood stone crab and lobster traps per year), docking fees (which in 2004 ran \$6 per foot per month for commercial vessels in Black Point Marina), and vessel maintenance and repair costs. Trap fishers also tend to hire one or more employees, depending on the size of the operation, who help with trap construction and maintenance on land and trap pulling at sea. Biscayne National Park trap fishers reported using only one mate, with the owner-operator conducting most of the work, including trap construction and repair.

While none of the trap fishers could provide an exact number of operators in the park, several believed that there were less than 10 blue crab fishers, 15 stone crab fishers, and 15 or more spiny lobster fishers (which included both trap fishers and commercial divers). The number of operators has increased in the park since the early 1970s, according to the most experienced fishers. One of these fishers stated that he knew of only three stone crab trap fishers (of who he

was one) in Biscayne National Park in 1972, and that the number of fishers had increased first with the closure of the Bahamas in the mid-1970s and then again in the 1990s. The number of trap fishers, and indeed that of all fishers, in the bay is controlled by resource abundance. One of the fishers pointed out how that number had declined in the past 5 years (1999-2004) due to low resource abundance years in all crustacean fisheries (first in spiny lobster, then in stone crab, and then in blue crab).

Most of the trap fishers interviewed fished out of commercial docks in southern Miami-Dade County (i.e., Black Point Marina) or Key Largo. Others trailer their vessels to public ramps in Bayfront Park, Black Point Marina, or Matheson Hammock (the three main ramp sites in the region), but these mainly consist of blue crab fishers, who tend to use smaller vessels (as described above). All respondents reported selling their catch locally and to one of following four fish houses: Arawak's Market (Miami-Dade County), City Fish (Miami-Dade County), Golden Rule Seafood (Miami-Dade County), or Key Largo Fisheries (Monroe County). Some of those interviewed stated that other fishers occasionally sell directly to restaurants as well. Many of the respondents viewed their activities as traditional, in the sense that they were participating in an occupation that is historical and fits a cultural need. Most of the fishers reported, for instance, that they were second generation fishers or greater, started fishing at a very early age, and viewed fishing as a way of life (as opposed to a business venture). Trap fisheries are also more ethnically diverse than the Anglo-dominated bait shrimp fishery or the Cuban wingnet shrimp fishery. Many Cubans who had fished on their island previously had reportedly entered the trap fisheries in Biscayne Bay, along with Anglo South Miami-Dade residents whose families had been fishing for two or more generations in the bay.

The most significant inter-group conflict identified by trap fishers, and especially stone crab fishers, is that of bait shrimp trawlers, which they believe are like "bulldozers," in that they destroy everything. In fact, one stone crab fisher who had been a sponger in Biscayne National Park until the 1991 closure added that it was the trawlers that were responsible for the reduction in sponge abundance and not the spongers. The stone crab fishers argue that the trawlers, which operate only at night, cut the stone crab lines, leading to lost traps. Each year, the etiquette practiced by past bait shrimp fishers deteriorates, such that gear loss has increased in each of the past 3 years (2001-2004). Three years ago, in 2001, the bait shrimp fishers and stone crab fishers reached an agreement to have the shrimp trawlers fish Biscayne Bay from Turkey Point to the north along the coast. However, from the perspective of the crab fishers, the trawlers quickly broke that promise. Because of the spatial separation of gear types, only the stone crab fishers reported this conflict. Blue crab traps are placed too close to the coast and in very shallow water, factors that effectively prevent trawler impacts. Conversely, spiny lobster traps are placed in

deeper water and over benthic habitats unsuitable to bait shrimp trawling, factors that prevent trawling impacts as well. However, because so many blue crab and spiny lobster trap fishers also use stone crab traps, trawler impacts on stone crab traps de facto affect most operations in these other trap fisheries.

Apart from the stone crab-bait shrimp fishery conflict, the other conflicts reported for the trap fisheries were poaching and recreational impacts. Blue crab fishers, for example, pointed out that they do not target highly productive areas (such as a nearshore area south of Matheson Hammock) due primarily to poaching. They prefer to fish less productive areas knowing that their traps will not be robbed. Similarly, spiny lobster fishers argued that while recreational divers do not currently poach from commercial traps as much as they have in the past, their destructive activities (e.g., turning over benthic structures, touching reefs, etc.) around the eastern reefs in Biscayne National Park nevertheless reduce fishing efficiency.

Trap fishers held fairly consistent views on management, believing that greater restrictions are needed on bait shrimp trawlers. While some argued that trawlers should be banned completely from Biscayne National Park and even Biscayne Bay, others believed that there should be seasonal closures or lines that halt bait shrimp fishing or separate it from stone crab trap fishing, respectively. A few others felt that management must address overcapacity, a problem that only recently has been experienced in the bay, with more fishers (especially bait shrimpers) entering than exiting the region. A solution preferred by these individuals is limited entry, which they believed would improve conditions for those fishers already in the fishery by disallowing further entrants. However, these fishers also argued that Biscayne National Park or whichever agency was making this decision should also provide guarantees to remaining fishers that no license reduction or buyback program would take place after limited entry provisions were in effect. Most fishers, according to these respondents, were already fearful that Biscayne National Park would be completely closed off to commercial fishing, and that the park needs to assure fishers that this is not a proposed outcome in its management plan. Overall, several trap fishers held pessimistic views on the ability of management to protect commercial fishing in Biscayne National Park. Two respondents who had been fishing for three decades or longer believed that the current generation shall be the last fully commercial fishing generation. According to these fishers, "in 20 years, fishers will not be here (BISC)."

Hook-and-Line and Spear Fisheries

Commercial hook-and-line (as opposed to charter and guide operations, which also use hook-and-line gear but as part of for-hire trips) and spear fishers are considered as a single sector

mainly because of the similarity in the species they target, although it must be pointed out that hook-and-line fishers in this section include pelagic longliners. Both groups are also similar in that both use similar areas and also because neither relies extensively on their primary gear (hook-and-line or spear) for a majority of their income.

Commercial hook-and-line fishers fish almost exclusively in waters 30 feet or deeper on the eastern side of Biscayne National Park. There, the fishers target reef fish complexes (primarily yellowtail snapper) on and around the eastern reefs, king and Spanish mackerel⁷ between the islands and the eastern reefs, and pelagics (dolphin, tuna, sharks, and tuna among others) in deeper waters off the eastern reefs. Spear fishers target mainly reef fish species along the eastern reefs, fishing between shallow waters (free diving) and 80 feet (with SCUBA).

Depending on the type of species targeted, the trends of fisheries vary considerably. For example, one respondent who uses longline gear in federal waters east of the bay islands but most likely still within Biscayne National Park boundaries⁸ stated that species' conditions – mainly sandbar and bull sharks – remain stable. Conversely, those who target nearshore and reef species reported that most fish species were depleted. One of the respondents who had been spear fishing the region since the 1960s likened the area to a "marine desert." Another believed that conditions were now bad enough that even if a complete ban were placed on commercial spear fishing that it would not affect the users.

Stressors identified by hook-and-line and spear fishers include bait shrimp trawlers, who tear up benthic environments, including sponges, and kill juvenile fish; pollution entering the bay via freshwater dumping into Barnes Sound and via other South Miami-Dade canals; and recreational fishing effort. The respondents believed that their group was often scapegoated for problems generated by other users, especially recreational fishers.

Because operation sizes differ considerably in the fishery (e.g., from full-time longline operations to part-time spear fishers), investments vary based on the size of the operation. For the larger, longline operations, vessel costs could exceed \$200,000, with gear costs reaching \$50,000 or greater. Conversely, spear fishers reported using smaller vessels (costing \$30,000 or

⁷ It should be noted that Spanish mackerel, more than king mackerel, is also landed from bay waters (or between the bay islands and Florida mainland), but because the species is highly migratory, its location and stock size shift on an inter-annual basis. Prior to the 1995 Florida Net Ban, when Spanish mackerel and other species could be harvested with nets in State of Florida waters, catch totals were higher in the region; however, since the ban, gill and other entangling nets have been prohibited from inshore waters, resulting in more variable catch dominated by hook-and-line.

⁸ This fisher stated that he fishes longline gear off Fowey Light (in the northeastern quadrant of the park) but could not ascertain whether his fishing takes place in Biscayne National Park or just outside its boundaries. It is likely, using a distance criterion of 3 nautical miles from the bay islands, that his activities take place within the park.

less) with few gear costs (e.g., SCUBA tanks, fins, etc.) and low operating costs (\$70 or less per trip). Similarly, larger operations use mates, while the smaller operation is often a single-person operation. Finally, it is unclear how many operators of each kind fish within the park, as neither fish houses nor respondents provided a clear answer to this question. Ethnographic data collected suggest, however, that use totals are low compared to the Florida Keys, and that hook-and-line or spear fishing is invariably supplemented by other fishing (or non-fishing) activities.

The group's respondents reported having strong ties to local communities, in that they live within the region, buy all of their gear from local vendors, participate in local economies, and sell mainly to local enterprises. The exception to this model are the longline fishers, who sell catch (e.g., shark fins) to processors for exportation to regional and foreign markets.

The main conflicts identified by members of this group are the bait shrimp trawlers (already discussed previously) and poachers, both of whom affect the total stock available for harvest. The other conflict described by one spear fisher is one the trap fishers raised, concerning the pressure exerted by recreational marina development on the availability of commercial dockage. The respondent believed that, due to the development pressures in general in South Florida and the rise in recreational fishers in particular, the region has experienced an increase in gentrification and will continue to do so unless restrictive measures are adopted.

Based on the precarious condition of the fishery (especially that segment utilized by reef fish hook-and-liners and spear fishers), it could be expected that the group would be in favor of more restrictive management measures. However, unlike the other groups, where there was more consensus among respondents, users from this group did not agree on management measures needed to improve the fishery conditions in the park. Interestingly, as previously stated, spear fishers felt that spear fishing could be prohibited if needed. While they believed that fishery management is working, they did not believe that there are sufficient finfishery resources (especially of the reef fish variety) that a ban in spear fishing would impact their overall livelihood. Similarly, the spear fishers interviewed were in favor of no-take zones. As long as only a small area is closed such that fishers can still use the general area, the respondents were in favor of closures. However, the other users – hook-and-line and longline fishers – were less in favor of closed zones and gear restrictions. They preferred that management consider limited entry as a means by which to restrict effort. Moreover, because these respondents generally did not perceive lowered resource conditions, their views on fishery management were consistent more with sustaining rather than rebuilding resources.

Bait Fish and Shrimp Net Fisheries

Both bait fish and shrimp net fisheries in this group target species used as bait, use nets as a primary gear type, and sell to local and regional bait fish markets. Conversely, their uses of Biscayne National Park and Biscayne Bay are considerably different. Bait shrimp fishers trawl the bay side; whereas, bait fish netters fish primarily the ocean side of Biscayne Bay, including areas north and south of the park as well as channels between the keys, due in part to the Florida Net Ban regulations. A majority of the bait shrimp landed from the region is harvested from Biscayne National Park, which can account for all of some shrimpers' catch. Bait shrimpers operate from close to the shore of the mainland to the bay islands, from as far south as Card Sound to the northern sections of the inner bay. However, as stated above, their primary fishing grounds are comprised of the Biscayne National Park bay bottom. Bait fish, especially ballyhoo, is also caught extensively within the park, with fishers splitting effort in the southern and northern sections of the park. Effort from the south, or that which originates from the Upper Keys, extends into the central portion of Biscayne National Park; whereas, effort from the north, which originates from within or north of the park in Miami-Dade County, extends to the southern portion of the park. Together, bait fish netters use almost all of Biscayne National Park up to the eastern boundary of the park, beyond which it is too deep (and presumably unproductive).

The fishers interviewed believe that the trend in bait species in Biscayne Bay is mainly cyclical, although both bait fish and shrimp fishers reported concern over recent (over the past decade in particular) increases in effort. Among those who target bait fish, the Florida Net Ban has provided a type of sanctuary for fish within inshore state waters, and they believe that this has helped regulate both effort and conserve stocks. Bait shrimp trawlers are less optimistic about their fishery, in terms of its future, but their concerns are driven less by stock abundance than by land-side factors. In general, their view on bait shrimp trends mirrors those of bait fish netters; of the shrimp trawlers interviewed, all agreed that conditions are improving. One respondent pointed to the increase in bait shrimp abundance in Card Sound over the past 2 years (2003-2004) as evidence for the cyclical nature of stocks.

For bait fish netters, there are few to no stressors, which may be in part related to the offshore areas that they target. One respondent did point out that the timing and release of freshwater into the lower bay is a concern, in that it drives away bait fish, but he also stated that the issue is not insurmountable. Bait shrimp trawlers felt very differently about stressors. They argued that pollution is responsible for any downturn in the local fisheries, with the South Miami-Dade landfill contributing leachate directly into the nearshore waters where shrimp fishers and other users operate. One trawler disclosed how he used to be able to swim in clear water all over the

southern bay 40 years ago, but now he cannot see the bottom in many areas in less than 6 feet. He believed that this type of gross deterioration, more than any overfishing impacts, has led to the decline of fisheries in the bay.

Bait shrimp fishing requires considerable capital investment and incurs high operating costs, compared to the other fisheries operating in the park. Conversely, bait fish netting is less expensive, as it can be conducted on vessels used for other commercial fisheries, including other net fisheries. Bait shrimp vessels, whose replacement values can exceed \$100,000, are invariably docked in one of the bay's two main shrimp trawler marinas: Dinner Key and Black Point. Rates for the former marina have increased significantly, according to one of the fishers interviewed, and these docking fee hikes may seriously affect shrimp trawler participation.

Apart from vessel and net gear costs, shrimp trawlers usually carry a crew of two to three persons, comprised of a captain and one to two mates (although vessels may at times be operated by a captain alone). Unlike the other fisheries in the bay, which are almost all horizontally oriented (i.e., owner-operated), many shrimp trawlers are vertically oriented. In these instances, a person may own one or more vessels that are operated by a captain(s) that the owner hires to work for a fixed salary or shares (the latter is the most common arrangement). Costs in the bait fish net fishery, as stated above, are lower than those for the bait shrimp fishery, although vessel costs may vary within the fishery. That is, net fishers use a variety of vessels, especially because several of the participants participate in more than one fishery. Gear costs, which consist mainly of the cost of nets, depend on the number and/or size of nets⁹ and, in some cases, may exceed \$20,000. Other costs depend on the arrangement that the fisher has with a fish house. For example, one of the respondents fishes exclusively for a fish house and therefore reported having no docking fees. In such cases, fishers sell all their catch to the fish house for a lower amount than they could obtain in the market; in return, they get subsidized dockage, simplified access to supplies (such as ice and bait), and do not need to seek multiple clients.¹⁰

Finally, none of the respondents from either bait fishery could provide an accurate number of fishers operating in their respective industries. The bait shrimp trawlers interviewed argued that the total number of shrimp fishers *operating* may be lower than can be determined by existing licenses, because of the industry's poor financial conditions. Bait fish netters believed that there

⁹ For an industrywide description of investments and gear, refer to Shavlani et al. (1998), who examined the socioeconomic effects of the Florida Net Ban in Monroe County, including the impacts on the region's bait fish fishery.

¹⁰ For all fishers operating from southern Miami-Dade County, no fish house arrangement exists, primarily because there are no fish houses that offer dockage and other facilities in the region. The closest such fish houses in Miami-Dade County are those located in the Miami River area (in central Miami-Dade County); otherwise, the closest fish house is Key Largo Fisheries, located in the Upper Keys section of Monroe County.

may be as many as 25 net fishers working in and around Biscayne National Park, and that this number had increased from as few as 15 operators only a decade ago.

The linkages to the community from each net fishery are significant. First, much of the product landed in both fisheries is sold locally. In the case of bait shrimp, respondents reported selling catch to an existing network of bait shops from Miami-Dade County to northern West Palm Beach (in one case, the network consisted of nearly 20 retailers). Also, unlike in many other fisheries where the product is sold to fish houses or processors, bait shrimp is sold almost directly to the retail market (that is, the bait shops may sell the shrimp to other, smaller retail markets). With bait fish, and especially with ballyhoo, the product is sold either to bait shops or to fish houses. In the former arrangement, bait fish netters behave much like their shrimp fisher counterparts, selling their catch to local bait shops. In the fish house system, the total catch is sold to the fish house, which then distributes it to regional and even national markets. Second, most of the goods and services needed for both fisheries are obtained from local markets, and these include the hiring of one to two crew members from the local community, purchasing supplies for each trip from local marine stores, and spending within the local community (as most participants in both fisheries are local residents). Third, there is a strong, albeit short, tradition in both fisheries. Some bait shrimp trawlers have fished the region for four decades, and both types of bait product have served the economically important, recreational fishery in south Florida. In general, net fishing, once a mainstay of the region, has declined precipitously since the Florida Net Ban; these two fisheries therefore represent the vestiges of a regional tradition.

Net fishers did not identify many intra-fishery or inter-fishery conflicts. For bait fish netters, the primary conflict was the increase in the number of participants in their fishery over the past decade. As stated by one of the individuals interviewed, "the higher number of people active in the fishery has resulted in increased competition, leading to the fishery being abused." Bait shrimp fishers believed that they operate in areas that they have a right to use, and that they are careful in not running over other gear, especially trap gear. In fact, unlike the stone crab fishers interviewed, who ranked this issue as the most explosive in their fishery, shrimp trawlers did not perceive it as much of a problem. As previously stated, they argued that they are careful in avoiding other gear (as it tends to damage their trawls), use only a small portion of the inner bay, and work mainly the winter months (or for a portion of the trap fisheries' seasons). Moreover, as one of the bait shrimp fishers added, the stone crab fishers need to be more concerned about reckless recreational boaters and poachers than about shrimp trawlers.

Finally, both groups were generally satisfied with existing regulations and preferred not to have additional or different sets of regulations within Biscayne National Park. The exception to this was the view shared by bait fish netters who argued that effort in the fishery and use of Biscayne National Park had increased significantly over the past decade. This increase, they argued, had not affected catch, but it had deteriorated the quality of product sold, due primarily to the poor handling practices of the incoming users. Therefore, at least as reported by one respondent, limited entry would be a good option by which to both limit effort and improve product quality. Neither group was in favor of having no-take zones in Biscayne National Park. Shrimp fishers argued that their target species moves considerably within the inner bay over a large swath of bottom, from inshore to nearshore waters, and a no-take zone would add effort. Bait fish netters were similarly opposed to closed areas, believing that they would not increase catches, and that zoning would only increase effort in areas left open.

Other User Groups and Industries

A total of five interviews (four completed with fish house owners and operators and one with a recreational fishing group representative) complete this descriptive section. Additional information for this section was derived from short interviews with local bait shop and retail fish market operators, as well as with related data collected during the ethnographic interviews.

Generally, fish houses and fish markets in the region do not rely on Biscayne National Park catch for much of their product. Instead, most rely on transshipments from Upper and Middle Keys' distributors to make up most of their supply. The highest number of Biscayne National Park-specific users that supply a single fish house did not exceed more than seven fishers (mainly blue crab, spiny lobster, and stone crab) that sold product to a Miami-Dade retail market. However, even that market reported that the Biscayne National Park catch comprised only a small percentage (less than 5 percent in most years) of its overall supply. Otherwise, local bait shops and retail markets reported purchasing product from local fishers during irregular intervals. None of these businesses, however, claimed to rely on these purchases from local fishers for all or even a majority of their total supply.

One of the main reasons for the lack of interdependency between local supply and local markets is the inability of Biscayne National Park catch to provide for local demand, both on a consistent basis and by volume required. Moreover, due to the larger amounts of identical product present in the adjacent Lee, Collier, and especially Monroe Counties (with the exception of blue crab, which can be similarly obtained from the northern Florida counties), local markets have developed inter-county networks to make up for lower, irregular local supply. Another potential

reason for the lack of interdependency may be due to the absence of waterfront fish houses in southern Miami-Dade County.

The bait shrimp fishery supply system represents a significant exception to the lack of interdependency exhibited by other local fisheries. Bait shrimp is sold locally in a network of local bait shops extending from the Florida Keys to northern Palm Beach (and most likely, beyond into regional and national markets). Fleet owners reported selling up to 90 percent of their catch within south Florida and to bait shops. As described by one respondent, catch is offered within the network of bait shops either the day before or morning after a trip, and the catch is then sent to the buyers once landed. Based on this information it is estimated that, among all fisheries operating in Biscayne National Park, only changes in supply in bait shrimp are most likely to impact the local economy. However, supplementary research focusing on the bait shop industry would better quantify the extent of those impacts (which may be minimal if substitute products could be obtained at lower or equal prices or if supply is sufficiently interrupted¹¹).

The other fishery that exhibits a limited amount of interdependency is the finfish retail market. Some of the local finfish landed within Biscayne National Park (mainly reef fish, but also highly migratory species) and from outside the eastern park boundary (mainly pelagic fish, including highly migratory species) is sold directly to restaurants or to consumers. The Crandon Park Marina is one location where charterboat operators sell part of their catch to Miami-Dade residents directly. Similarly, spear fishers interviewed reported selling their catch, which is often comprised of larger, more sought-after species like grouper, directly to local restaurants. However, the linkages as such are limited in the volume of fishery product supplied and most likely do not represent a significant percentage of the retail market.

While the aforementioned fisheries and the for-hire sectors do not contribute significantly to the local economy in terms of fishery product landed, they do contribute through their purchasing of supplies from local enterprises, employing local personnel, and residing in the local region. For-hire operations, such as flats guides and charterboats, add value to the local tourism economy and expose their clientele to the region's coastal and marine environment. Finally, the local fisheries in many cases represent the remainder of what was once an important traditional activity in south Florida, but increasing pressures from a variety of sources are likely to continue the long-term trend of fleet reductions. Some apparent trends do not bode well for the long-term

¹¹ The phenomenon of lower prices following regulatory restrictions is exemplified by the price of net-caught fish following the Florida Net Ban. In the years after the ban, prices for fish landed by nets remained the same or actually decreased, due in part to the erratic supply (Shivlani et al. 1998).

outlook for at least some of the fisheries. For example, both the local crab and lobster fisheries require space for gear storage, but the nature of waterfront use has been changing over time. If the area's marinas no longer allow commercial dockage, or if such dockage becomes too expensive to be economically viable for commercial fishing operations (due to increased demand related to increasing recreational use intensity that is driven, in turn, by increasing area population and a shift away from a locally extractive economy), then commercial fishers are in a double bind -- they will be forced into less efficient vessel operations and there will not be waterfront storage space available for the traps that must be removed from the fishing grounds during the off season. In some ways, if commercial fisheries are lost over time the region as a whole will lose something of its social fabric as the fisheries provide more than an economic service -- they remind the region of its coastal heritage and assist in forging a common identity in a city and its greater metropolitan area that is increasingly fragmented through modernization and development.

Relevance of Ethnographic Findings to Overall Fishery Conditions

Having discussed conditions in various fisheries in Biscayne National Park and its environs, an important question remains: How representative, or even relevant, are these findings to the overall fishery conditions? Put another way, it could be argued that two or three representatives from each fishery cannot provide meaningful information on the entire fishery, due in part to the persons' incomplete knowledge and as a result of personal biases. Therefore, it could be concluded that the entire ethnographic description is only a partial one, comprised of socioeconomic histories of only the participants interviewed.

While it is not stated that ethnographic interviews in this context can replace a full study, the present effort has focused mainly on fishery-level conditions as related by experienced fishers in each industry. For example, among the guides interviewed, the average time of tenure in Biscayne Bay was over 35 years. Similarly, the bait shrimp fishers who participated in the study were born and raised in south Florida, and both were among the first generation of shrimp trawlers in Biscayne Bay. In fact, all of the participants in the study had used Biscayne Bay prior to the 1981 designation of Biscayne National Park (from the Biscayne Bay National Monument). Also, each of the participants (with the exception of the for-hire operations for which high-liner status is not meaningful but who were selected based on expert advice) who has participated in this study is among the top producers for the region. These so-called high-liners have intimate knowledge of Biscayne Bay, Biscayne National Park, and their species of concern, as they often led the fishery in landings and have been consistent producers over a long period of time. Finally, based on how the study has been designed and on the approach used to interview

respondents, it has been possible to learn extensively about the fishery-level conditions. Using an open-ended questionnaire has allowed for the collection of as much information as participants deemed was important, the expertise of the researcher on local fishery issues and other conditions has allowed for more focused exchange, and the length of the interview (which lasted an average of 1 hour) has provided the time necessary to discuss fishery and related topics.

There are some findings from the study that should be weighed carefully, however. These are the findings that relate mainly to the views held by participants on management. That is, in such cases, a high-liner cannot speak for the entire fishery, and that person's opinion should not be extrapolated to that of the population. For example, the bait fish netters interviewed for this study agreed that limited entry may be a good option for the fishery. While it could be stated that the respondents' views are motivated by their concern for stock status and product quality, it could also be argued that by agreeing to limited entry, the fishers want to eliminate competition. In both cases, however, the end result is the sustainability of the stock in question, with the only issue being how that is achieved.

ENVIRONMENTAL JUSTICE

Overview

Environmental justice can be interpreted as the fair treatment of all people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of laws and policies. Closer examination of minority and low-income populations is warranted through the adoption of a 1994 directive designed specifically to examine impacts to such things as human health of minority populations, low-income populations, and Indian tribes and is commonly known as Environmental Justice. Executive Order 12898 (Environmental Justice, 59 Fed. Reg. 7629 [1994]) requires each federal agency to achieve environmental justice by addressing "disproportionately high and adverse human health and environmental effects on minority and low-income populations." The demographics of the affected area should be examined to determine whether minority populations, low-income populations, or Indian tribes are present in the area impacted by the proposed action. If so, a determination must be made as to whether the implementation/development of the proposed project may cause disproportionately high and adverse human health or environmental effects, including the interrelated social and economic effects of programs, policies, and activities on the minority populations or low-income populations present.

According to federal guidelines, minority groups include the following populations: Black or African American, American Indian or Alaskan Native, Asian, and Native Hawaiian or Other Pacific Islander. Additionally, persons of Hispanic ethnicity (of any race) are also considered to be a minority group, and for the purposes of this analysis, "minority" also includes all other non-White racial categories within the census. The Interagency Federal Working Group on Environmental Justice guidance states that a "minority population" may be present in an area if the minority population percentage in the area of interest is "meaningfully greater" than the minority population in the general population. The Council on Environmental Quality defines "low income populations" as those identified with the annual statistical poverty thresholds from the U.S. Bureau of the Census. The accepted rationale in determining what constitutes a low-income "population" is similar to minority populations, in that when the low-income population percentage within the area of interest is "meaningfully greater" than the low-income population in the general population.

Local Population Distribution

For the purposes of this analysis, those tracts with a total minority population of at least 87.2 percent (a figure at least proportionally 20 percent higher than the Miami-Dade County average of 79.3 percent) were classified as minority populations. As of 2000, the countywide average poverty level was 14.5 percent. For the purposes of this analysis, low-income communities were defined as those tracts where the poverty level was in excess of 17.4 percent (a figure at least proportionally 20 percent higher than the county average of 14.5 percent).

Figure 28 illustrates the distribution of minority populations in Miami-Dade County. Most of the minority populations are located within the northern half of the county, specifically within the communities in central and northern Miami. Minority populations extend across much of the area north of Highway 27 and, aside from the city of North Miami Beach, north to the county line and include the cities of Hialeah, Opa Locka, and Sweetwater to the east. Further south, minority populations are much more limited and are mostly located within the corridor surrounding Highway 826, including cities and communities such as South Miami and Richmond Heights. Minority populations are also located within the cities of Homestead and Florida City.

Figure 29 shows the distribution of low-income populations. For the most part, the distribution of low-income populations is similar to that of the minority populations described above. However, they are generally less widespread within the northern portion of the county and are

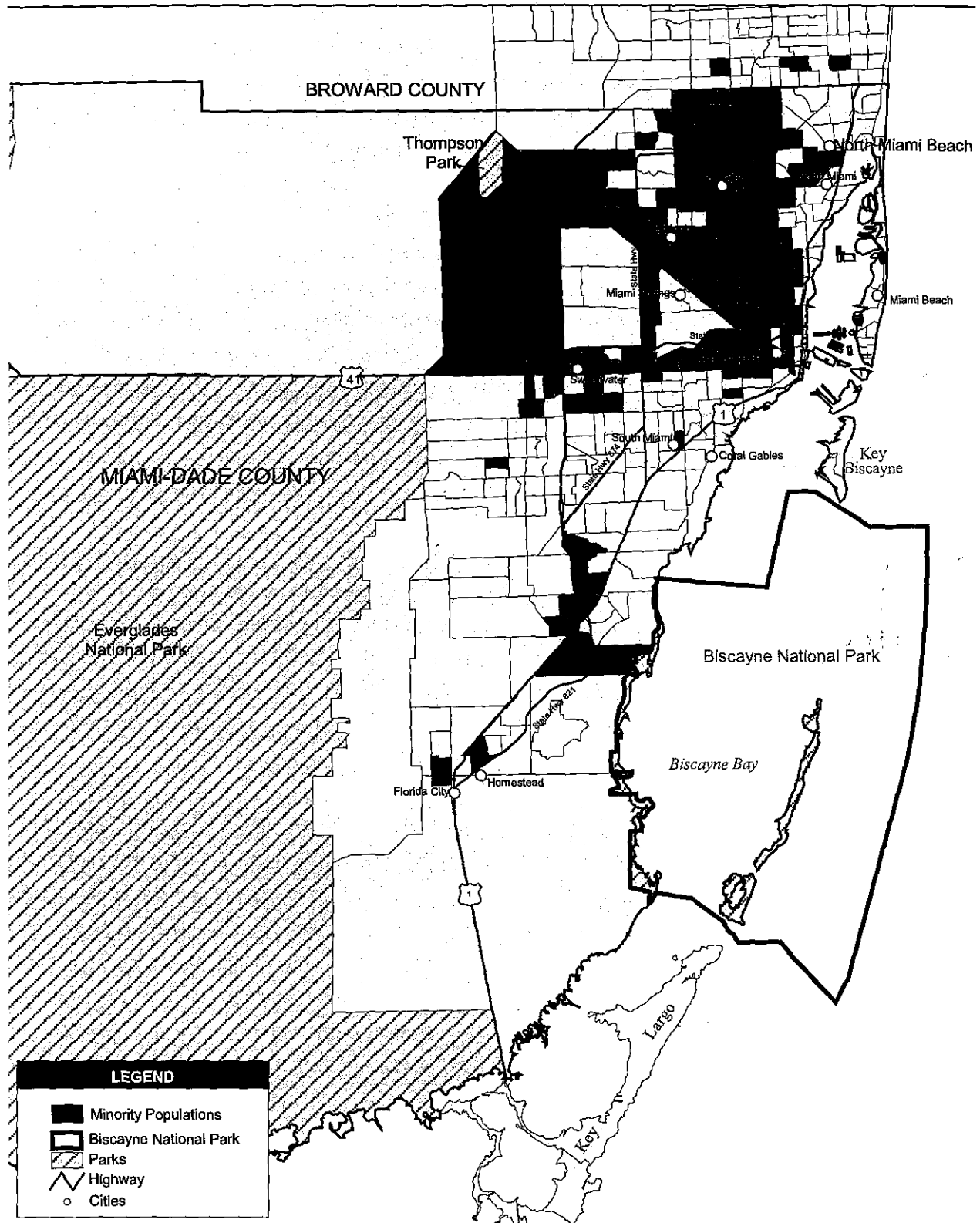
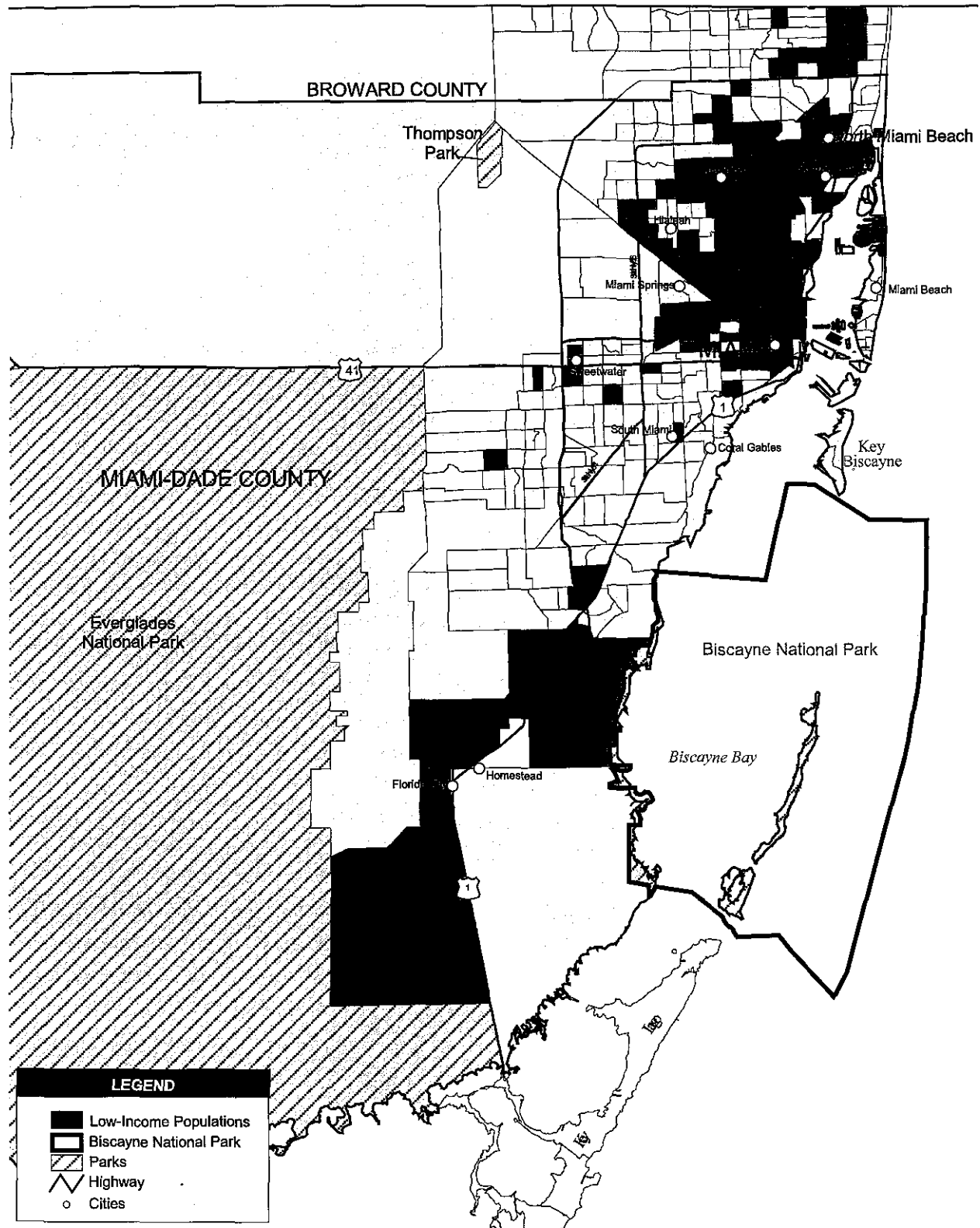


Figure 28
Total Minority Populations
by Census Tract



Sources: Census 2000

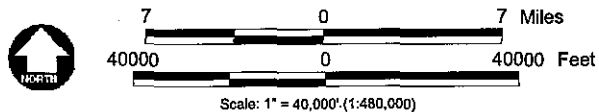


Figure 29
Low-Income Populations
by Census Tract

more prevalent in the south. Low-income populations are clustered in central and northern Miami and in cities and communities including Ojus, western Uleta, and Biscayne Gardens. To the east, low-income populations surround the city of Hialeah and are in the cities of Hialeah Gardens and Sweetwater. To the south, low-income populations are present in Florida City and Homestead, but they are also present in more sparsely populated areas to the northeast of Homestead and adjacent Highway 1.

Potentially Undercounted Populations

Migrant farm workers are classified as those whose employment requires travel that prevents the employee from returning to his or her permanent place of residence the same day. As such, migrant farm workers can be members of either minority or low-income populations, but their travel could prevent them from being available for census data gathering. This could result in migrant farm workers being underrepresented in minority and/or low-income population analyses based on census results.

Citrus groves, orchards, and row crops remain widespread in south Miami-Dade County. As such, the larger numbers of farms within the southern half of the county mean that migrant farm workers are frequently present in these areas. While reliable data regarding the number of migrant farm workers are unavailable, in 1997 approximately 9,000 hired farm workers were estimated to be in Miami-Dade County (Florida Power & Light Company 2002). It is reasonable to assume that migrant farmers would be located throughout the agricultural areas of the county and not clustered in a single location. Due to their relatively small numbers, however, it is not anticipated that the migrant farm worker population would significantly change the population characteristics of a given community (Florida Power & Light Company 2002).

ENVIRONMENTAL CONSEQUENCES

SOCIOECONOMIC IMPACTS OF ALTERNATIVE 1 (NO CHANGE)

Introduction

Alternative 1 represents a continuation of existing fisheries management measures and policies employed within the park. Under this alternative, the current variety and extent of commercial and recreational fishing activities within the park, including guided sport fishing, would continue to occur. No regulatory changes would be specifically triggered under this alternative. Data pertaining to populations of fishery-targeted fish and shellfish, recreational catch and effort, and habitat conditions would continue to be gathered and monitored by Biscayne National Park. Commercial landings would continue to be monitored through the Florida Fish and Wildlife Conservation Commission trip ticket system. No short-term effects to the fisheries within the park are anticipated. Under this alternative, commercial and recreational fishing activities within the park would remain unaffected.

Commercial Fishing Activities

Under this alternative, commercial fishing activities within the park would remain unaffected. From a long-term perspective, the protracted fluctuations in commercial landings over the last several decades and the contraction of the commercial fishing fleet operating within the park as noted in the affected environment section may continue. Such ongoing conditions would represent a negligible economic impact to the region as a whole, but could be considered adverse on either a fishery sector basis or a more localized level within the park-adjacent communities that serve as the residential base for commercial fishermen; homeport for vessel operations; or the location of support activities for the industry, including fish buying/wholesaling/distributing operations and vessel support businesses.

Recreational Fishing Activities

Under this alternative, recreational fishing activities within the park would remain unaffected. Guided sport fishing activities, and commercial boating activities related to recreational fishing activities, primarily charter boats would also be unaffected under this alternative. The recreational fisheries within the park would continue to attract significant numbers of tourists

and residents alike, and these levels of recreational fishing activity and related regional economic expenditure are anticipated to continue.

Support Businesses

Expenditures related to commercial and recreational fishing activities within the park can include frequently recurring expenditures such as fishing tackle, bait, boat fuel, clothing, food and beverage supplies, and ice and are made by both resident and non-resident anglers. They also include less frequent but more substantial expenditures on vessels, engines, trailers, and the like, along with maintenance, repair, and storage/moorage associated expenditures. Support businesses significantly contribute to the local and regional economy. Under this alternative, commercial and recreational fishing activities within the park would remain unaffected. Expenditures within the various support businesses would remain similarly unaffected.

Community and Regional Impacts

Communities near Biscayne National Park that support commercial and recreational fishing activities would remain unaffected by this alternative. No short-term effects to the local or regional economy are anticipated. The regional economic impacts as a result of this alternative would be negligible.

Cumulative Impacts

This alternative continues all current management measures that seek to preserve and improve the natural resources within the park. However, a long-term, significant increase in both local and tourist visitation levels may result in increased pressures on park fisheries, impacting and degrading the ongoing sustainability of the fisheries of the park and their role as a valuable social and economic resource to the region.

SOCIOECONOMIC IMPACTS OF ALTERNATIVE 2 (MINOR CHANGE FROM CURRENT MANAGEMENT)

Introduction

Alternative 2 would represent only a minor change from current management strategies. Under this alternative, the current variety and extent of commercial and recreational fishing activities within the park, including guided sport fishing, would continue to occur. The primary focus of

this alternative is to maintain fish stocks and habitat condition at or *above* current levels, while keeping the recreational harvest and numbers of commercial fishers at or *below* current levels. No regulatory changes would be specifically triggered under this alternative. Similarly to Alternative 1, data pertaining to populations of fishery-targeted fish and shellfish, recreational catch and effort, and habitat conditions would continue to be gathered and monitored by Biscayne National Park. Commercial landings would continue to be monitored through the Florida Fish and Wildlife Conservation Commission trip ticket system. This alternative seeks to maintain existing abundances and size distributions of fishery-targeted fish and shellfish. If abundance and size distributions remained constant, the impacts of this alternative would be the same as those seen under Alternative 1. If abundance and size distributions declined, park specific management actions would be considered to return population to their current conditions.

Commercial Fishing Activities

Under this alternative, commercial fishing activities within the park would remain unaffected on a short-term basis. The current variety and extent of commercial fishing activities within the park would continue to occur. Under this alternative, no new commercial fisheries would be allowed to develop within the park, and future numerical growth of commercial fishermen would be prevented. However, on both a short- and long-term basis, impacts related to these measures themselves are considered minor and unlikely to be significant given the ongoing incremental decline in commercial landings and the related contraction of the commercial fishing fleet operating within the park noted in the affected environment section. While such a decline would represent a negligible economic impact to the region as a whole, it could be potentially significant on a more localized level. The imposition of a requisite \$100 Special Use Permit for commercial fishers operating within the park, while incrementally economically adverse to said fishers, is considered a minor localized impact and a negligible regional economic impact.

In relation to commercial fishing activities, from a long-term perspective potential management measures under this alternative designed to maintain existing abundances and size distributions of fishery-targeted fish and shellfish could involve increasing minimum harvest sizes, limiting the number of commercial fishers and/or areas fished within the park. Impacts to commercial fishing activities from these measures, while potentially significant from the perspective of the fishers themselves and to a lesser extent from communities where they are primarily located, would again only represent a negligible economic impact to the region as a whole. As described in the affected environment section, different fisheries take place within different areas of the park. Depending upon which areas were closed, different fisheries (and groups of fishermen and

related businesses) would be more or less affected. Until area closures are specified, impacts cannot be more closely defined.

Recreational Fishing Activities

Under this alternative, recreational fishing activities within the park would remain unaffected on a short-term basis. Guided sport fishing activities, and commercial boating activities related to recreational fishing activities, primarily charter boats, would also be unaffected under this alternative. The recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike, and these levels of recreational fishing activity and related regional economic expenditure are anticipated to continue. The primary management measures related to recreational fishing activities under this alternative concern a continuation of monitoring the levels of visitor and resident satisfaction of the recreational fishing experience within the park. Specifically, if satisfaction levels fall below 90 percent, Biscayne National Park would endeavor to ascertain the characteristics associated with a satisfactory experience and seek to implement them, if practicable.

While the extent and nature of the measures that would be implemented to improve the recreational fishing experience are unknown, any improvement to the recreational fishing experience within Biscayne National Park, assuming no detriment to the underlying fishery resource would occur as a result, is to be considered a long-term positive social and economic impact to the region. As described in the affected environment section, however, very different recreational fisheries occur in different parts of the park. If area closures were implemented, very different groups would be affected as, for example, shoreline fishery closures would have a greater impact on residents of adjacent communities, while offshore closures would have a greater impact on a more dispersed population. No short-term effects to the local or regional economy are anticipated. The regional economic impacts as a result of this alternative would be negligible.

Support Businesses

As outlined in the Alternative 1 discussion, expenditures related to commercial and recreational fishing activities within the park can include fishing tackle, bait, boat fuel, clothing, food and beverage supplies, and ice and are made by both resident and non-resident anglers. They also include less frequent but more substantial expenditures on vessels, engines, trailers, and the like, along with maintenance, repair, and storage/moorage associated expenditures. Support businesses significantly contribute to the local and regional economy.

Under this alternative, commercial and recreational fishing activities within the park would remain unaffected on a short-term basis. Long-term impacts related to support services through implementation of potential management actions under this alternative are considered to be minor given the likelihood of ongoing incremental decline in commercial landings and the related contraction of the commercial fishing fleet operating within the park. Additionally, the recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike, and these levels of recreational fishing activity and related regional economic expenditure are anticipated to continue. Expenditures within the various support businesses would remain similarly unaffected.

Community and Regional Impacts

Communities that support commercial and recreational fishing activities could potentially experience minor long-term impacts under this alternative. No short-term effects to the local or regional economy are anticipated. The regional economic impacts as a result of this alternative would be negligible.

Cumulative Impacts

This alternative would represent only a minor change from current management strategies that seek to preserve and improve the natural resources within the park. However, a long-term, significant increase in both local and tourist visitation levels may result in increased pressures on park fisheries, impacting and degrading the ongoing sustainability of the fisheries of the park and their role as a valuable social and economic resource to the region.

SOCIOECONOMIC IMPACTS OF ALTERNATIVE 3 (MODERATE CHANGE FROM CURRENT MANAGEMENT)

Introduction

Alternative 3 would represent a moderate change from current management strategies. Under this alternative, the variety and extent of commercial and recreational fishing activities within the park would be partially curtailed. The primary focus of this alternative is to improve stocks of fishery-targeted fish within the park by at least 10 percent *above* current levels. Fishery-targeted invertebrate populations would be maintained within historical levels. Several regulatory changes would be specifically triggered under this alternative. Similar to Alternatives 1 and 2,

data pertaining to populations of fishery-targeted fish and shellfish, recreational catch and effort, and habitat conditions would continue to be gathered and monitored by Biscayne National Park. Commercial landings would continue to be monitored through the Florida Fish and Wildlife Conservation Commission trip ticket system. This alternative seeks to improve existing abundances and size distributions of fishery-targeted fish and shellfish. To do this, park-specific management actions would be implemented to raise the specific population to their targeted levels.

Commercial Fishing Activities

Under this alternative, commercial fishing activities within the park would be moderately affected on both a short-and long-term basis. A zone would be established north and east of Convoy Point in which deployment of commercial or recreational crab traps would be prohibited. This would directly impact relatively few fishermen, as described in the affected environment section, but it may be a highly adverse impact to those individuals. The remaining variety and extent of commercial fishing activities within the park would continue to occur. Additional potential management measures under this alternative designed to increase existing abundances and size distributions of fishery-targeted fish and shellfish to the stated goals could involve increasing minimum harvest sizes, limiting the number of commercial fishers and/or areas fished within the park. The impact to commercial fishing activities through these measures would be dependent on the specifics and severity of the restrictions chosen. As described in the affected environment section, different fisheries take place within different areas of the park. Depending upon which areas were closed, different fisheries (and groups of fishermen and related businesses) would be more or less affected. Until area closures are specified, impacts cannot be more closely defined.

Under this alternative, no new commercial fisheries would be allowed to develop within the park, and future numerical growth of commercial fishermen would be prevented and possibly reduced through a temporarily non-transferable, "use-or-lose" Special Use Permit. It is worth noting that previous experience has shown that upon the introduction of a commercial entry limitation permit system, permit holders under threat of losing their permit typically modify their behavior, including increasing effort over previously anticipated levels, to keep the permit valid to optimize future returns and/or retain flexibility in decision-making. In effect, the potential measures designed to numerically reduce permit levels through attrition may not, in fact, have the desired effect at least in the short term. The imposition of a \$100 fee for the Special Use Permit for commercial fishers operating within the park, while incrementally economically adverse from the perspective of the fishers themselves and to a lesser extent from communities

where they are primarily located, is considered to be a minor localized impact and a negligible regional economic impact.

On both a short- and long-term basis, the significance of the impacts related to these measures is somewhat lessened given the likelihood of the trend of incremental decline in commercial landings and the related contraction of the commercial fishing fleet operating within the park noted in the affected environment section. While the continuation or marked increase of such a decline would represent a negligible economic impact to the region as a whole, it could be potentially significant on an individual operation, fishery sector, or a localized level in the communities that are home to the fishermen, vessels, or related support service activities.

Recreational Fishing Activities

Under this alternative, the extent and nature of recreational fishing activities within the park would be slightly curtailed on both a short- and long-term basis. Guided sport fishing activities, and commercial boating activities related to recreational fishing activities, primarily charter boats, would not be specifically affected under this alternative. This alternative seeks to moderately augment existing abundances and size distributions of fishery-targeted fish. To do this, a variety of park specific management actions would be considered to increase populations to the targeted conditions.

Potential measures range from increases in minimum harvest sizes, numerical limitation of recreational fishers, to seasonal and/or spatial closures of park areas. While the exact extent and nature of the measures that would be implemented to increase populations to the targeted conditions are unknown, these measures may impact the levels of recreational fishing activities to varying extents within the park. Given the lack of specificity concerning the potential measures, for instance the temporal and spatial extent of the park areas to be closed, or the practicality of numerically limiting recreational fishers, actual impacts to recreational fishing activities are difficult to forecast. As described in the affected environment section, however, very different recreational fisheries occur in different parts of the park. If area closures were implemented, very different groups would be affected as, for example, shoreline fishery closures would have a greater impact on residents of adjacent communities, while offshore closures would have a greater impact on a more dispersed population.

Other specific measures related to recreational fishing activities under this alternative include limiting spear fishing to gear lacking a trigger mechanism, prohibiting the use of supplied air equipment (SCUBA or hookah) during spear fishing, and the elimination of the 2-day

recreational lobster sport season. While spear fishing would continue to be allowed, the mandated equipment restrictions would both limit the popularity of the activity and incrementally decrease indirect revenues for businesses that service the spear fishers (such as dive shops). The recreational lobster sport season, while short, is a very popular event that does generate a peak of diving activity (and related expenditures at local dive shops). The elimination of the season would substantially reduce recreational fishing within the park over the 2-day event.

The imposition of a \$25 fee for a Recreational Fishing Permit within the park would be incrementally economically adverse from the perspective of the fishers themselves. It would, however, be considered to represent only a minor localized economic impact and a negligible regional economic impact.

It is anticipated that even with the additional restrictions in place under this alternative, the recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike, and significant levels of recreational fishing activity and related regional economic expenditure are anticipated to continue. Recreational fishing activities would continue to provide long-term positive social and economic impacts to the region. Minor short-term effects to the local or regional economy are anticipated. The regional economic impacts as a result of this alternative could range from minor to negligible.

Support Businesses

Expenditures related to commercial and recreational fishing activities within the park can include fishing tackle, bait, boat fuel, clothing, food and beverage supplies, and ice and are made by both resident and non-resident anglers. They also include less frequent but more substantial expenditures on vessels, engines, trailers, and the like, along with maintenance, repair, and storage/moorage associated expenditures. Support businesses significantly contribute to the local and regional economy.

Under this alternative, commercial and recreational fishing activities within the park may be moderately affected on a short- and long-term basis. Long-term impacts related to commercial fishing support services through implementation of potential management actions under this alternative are considered to be minor given the likelihood of ongoing incremental decline in commercial landings and the related contraction of the commercial fishing fleet operating within the park.

The recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike, and levels of recreational fishing activity and related regional economic expenditure are anticipated to remain significant. However, several of the park-specific management actions could potentially significantly affect levels of expenditures by recreational fishers among a variety of support businesses. These include impacts to specific support businesses such as dive shops through the gear restrictions to sport fishing, and the elimination of the 2-day recreational lobster sport season.

Additionally, any impacts related to the potential numerical limitation of recreational fishers, or seasonal and/or spatial closures of park areas would be felt across a wide variety of support businesses. Again, given the lack of specificity concerning these potential measures, the extent of actual impacts to the support services sector is difficult if not impossible to calculate.

Community and Regional Impacts

Communities that support commercial and recreational fishing activities could potentially experience both short- and long-term impacts under this alternative. The regional economic impacts as a result of this alternative would be minor.

Cumulative Impacts

This alternative would represent a moderate change from current management strategies that seek to preserve and improve the natural resources within the park. However, a long-term, significant increase in both local and tourist visitation levels may still result in increased pressures on park fisheries, impacting and degrading the ongoing sustainability of the fisheries of the park and their role as a valuable social and economic resource to the region.

ALTERNATIVE 4 (CONSIDERABLE CHANGE FROM CURRENT MANAGEMENT)

Introduction

Alternative 4 would represent a considerable change from current management strategies. Under this alternative, the variety and extent of commercial and recreational fishing activities within the park would be partially curtailed. The primary focus of this alternative is to improve stocks of fishery-targeted fish within the park by at least 20 percent *above* current levels. Fishery-targeted invertebrate populations would be maintained within historical levels. Several regulatory changes would be specifically triggered under this alternative. Similar to Alternatives 1, 2, and 3,

data pertaining to populations of fishery-targeted fish and shellfish, recreational catch and effort, and habitat conditions would continue to be gathered and monitored by Biscayne National Park. Commercial landings would continue to be monitored through the Florida Fish and Wildlife Conservation Commission trip ticket system. This alternative seeks to significantly improve existing abundances and size distributions of fishery-targeted fish and shellfish. To do this, park specific management actions would be implemented to raise the specific population to their targeted levels.

Commercial Fishing Activities

Under this alternative, commercial fishing activities within the park would be moderately affected on both a short-and long-term basis by spatial restrictions. A zone would be established north and east of Convoy Point in which deployment of commercial or recreational crab traps would be prohibited. This would directly impact relatively few fishermen, as described in the affected environment section, but it may be a highly adverse impact to those individuals. The remaining variety and extent of commercial fishing activities within the park would continue to occur. Additional potential management measures under this alternative designed to increase existing abundances and size distributions of fishery-targeted fish and shellfish to the stated goals could involve increasing minimum harvest sizes, limiting the number of commercial fishers and/or areas fished within the park. The impact to commercial fishing activities through these measures would be dependent on the specifics and severity of the restrictions chosen.

Under this alternative, no new commercial fisheries would be allowed to develop within the park, and future numerical growth of commercial fishermen would be prevented and possibly reduced through a permanently non-transferable, "use-or-lose" Special Use Permit. It is worth noting that previous experience has shown that upon the introduction of a commercial entry limitation permit system, permit holders under threat of losing their permit typically modify their behavior, including increasing effort over previously anticipated levels, to keep the permit valid to optimize future returns and/or retain flexibility in decision-making. In effect, the potential measures designed to numerically reduce permit levels through attrition may not, in fact, have the desired effect at least in the short term, but the feature of making the permits permanently non-transferable may limit this type of short-term "fishing for permit history" behavior. Further, on a short-term basis, the significance of the impacts related to these measures may be ameliorated to a degree, if both overall commercial landings continue to fluctuate over time and the commercial fishing fleet operating within the park continues its trend of decline as noted in the affected environment section.

On a long-term basis, an eventual complete cessation of commercial fishing activity within the park would be predicted under this alternative as a result of implementation of the permanently non-transferable, "use-or-lose" Special Use Permit. Specific details related to the potential permit system are not available at this point. However, the introduction of such a non-transferable permit system based on individual permit holders would eventually lead to the complete loss of commercial fishing activity within the park over the course of a generation, as currently active fishermen exit the fishery through retirement or otherwise are unable to continue fishing (or upon their death if permits could be fished by others through leasing or similar arrangements). If the permits were tied to vessels rather than individuals, the course of eventual cessation of commercial fishing would be less clear, and it is also unclear how permits tied to individuals or vessels would be handled in the case of single owners who currently own multiple vessels. In any case, while the eventual cessation of commercial fishing within Biscayne National Park would represent a negligible economic impact to the region as a whole, it would be potentially significant on an individual operation, fishery sector, or a localized level in the communities that are home to the fishermen, vessels, or related support service activities. It would also represent the end of a traditional way of life for at least some individuals and families if not larger groups.

The imposition of a \$100 fee for the Special Use Permit for commercial fishers operating within the park, while incrementally economically adverse from the perspective of the fishers themselves and to a lesser extent from communities where they are primarily located, is considered to be a minor localized impact and a negligible regional economic impact.

As described in the affected environment section, different fisheries take place within different areas of the park. Depending upon which areas were closed, different fisheries (and groups of fishermen and related businesses) would be more or less affected. Until area closures are specified, impacts cannot be more closely defined.

Recreational Fishing Activities

Under this alternative, the extent and nature of recreational fishing activities within the park would be partially curtailed. Guided sport fishing activities, and commercial boating activities related to recreational fishing activities, primarily charter boats, would not be specifically affected under this alternative. This alternative seeks to considerably augment existing abundances and size distributions of fishery-targeted fish. To do this, a variety of park-specific management actions would be considered to increase populations to the targeted conditions.

Potential measures range from increases in minimum harvest sizes, numerical limitation of recreational fishers, to seasonal and/or spatial closures of park areas. While the exact extent and nature of the measures that would be implemented to increase populations to the targeted conditions are unknown, these measures may impact the levels of recreational fishing activities to varying extents within the park. Given the lack of specificity concerning the potential measures, for instance the temporal and spatial extent of the park areas to be closed, or the practicality of numerically limiting recreational fishers, actual impacts to recreational fishing activities are difficult if not impossible to calculate.

Other specific measures related to recreational fishing activities under this alternative include prohibiting spear fishing, and the elimination of the 2-day recreational lobster sport season. The prohibition of spear fishing would reduce the levels of recreational fishing activity within the park as well as incrementally decrease indirect revenues for businesses that previously serviced the spear fishers. The recreational lobster sport season, while short, is a very popular event that does generate a peak of diving activity (and related expenditures at local dive shops). The elimination of the season would substantially reduce recreational fishing within the park over the 2-day event.

The imposition of a \$25 fee for a Recreational Fishing Permit within the park, would be incrementally economically adverse from the perspective of the fishers themselves. It would, however, be considered to represent only a minor localized economic impact and a negligible regional economic impact.

It is anticipated that even with the considerable additional restrictions in place under this alternative, the recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike and significant levels of recreational fishing activity and related regional economic expenditure are anticipated to continue. Recreational fishing activities would remain a long-term positive social and economic impact to the region. As described in the affected environment section, however, very different recreational fisheries occur in different parts of the park. If area closures were implemented, very different groups would be affected as, for example, shoreline fishery closures would have a greater impact on residents of adjacent communities, while offshore closures would have a greater impact on a more dispersed population. Aside from these potential group-specific impacts, only minor short-term effects to the local or regional economy are anticipated. The regional economic impacts as a result of this alternative could range from minor to negligible.

Support Businesses

Expenditures related to commercial and recreational fishing activities within the park can include fishing tackle, bait, boat fuel, clothing, food and beverage supplies, and ice and are made by both resident and non-resident anglers. They also include less frequent but more substantial expenditures on vessels, engines, trailers, and the like, along with maintenance, repair, and storage/moorage associated expenditures. Support businesses significantly contribute to the local and regional economy.

Under this alternative, commercial and recreational fishing activities within the park may be moderately affected on a short- and long-term basis. Long-term impacts related to commercial fishing support services through implementation of potential management actions under this alternative are considered to be minor given the likelihood of ongoing incremental decline in commercial landings and the related contraction of the commercial fishing fleet operating within the park.

The recreational fisheries within the park would continue to attract significant numbers of tourists and residents alike, and levels of recreational fishing activity and related regional economic expenditure are anticipated to remain significant. However, several of the park-specific management actions could potentially significantly affect levels of expenditures by recreational fishers among a variety of support businesses. These include impacts to specific support businesses such as dive shops due to the prohibition of spear fishing and the elimination of the 2-day recreational lobster sport season.

Additionally, any impacts related to the potential numerical limitation of recreational fishers, or seasonal and/or spatial closures of park areas would be felt across a wide variety of support businesses. Again, given the lack of specificity concerning these potential measures, the extent of actual impacts to the support services sector is difficult if not impossible to calculate.

Community and Regional Impacts

Communities that support commercial and recreational fishing activities could potentially experience both short- and long-term impacts under this alternative. The regional economic impacts as a result of this alternative would be minor.

Cumulative Impacts

This alternative would represent a considerable change from current management strategies that seek to preserve and improve the natural resources within the park. However, a long-term, significant increase in both local and tourist visitation levels may still result in increased pressures on park fisheries impacting/degrading the ongoing sustainability of the fisheries resource of the park and its role as valuable social and economic resource to the region.

UNAVOIDABLE ADVERSE IMPACTS

Under all of the action alternatives, the potential additional management measures designed to maintain or increase existing abundances and size distributions of fishery-targeted fish and shellfish to specific stated goals could involve increasing minimum harvest sizes, therefore limiting the number of commercial or recreational fishers and/or areas fished within the park. These measures would adversely affect commercial and recreational fishing activities within the park, although the extent and nature of such impacts would be dependent on the specifics and severity of the restrictions chosen.

Under Alternatives 3 and 4, the proposed zone north and east of Convoy Point in which deployment of commercial or recreational crab traps would be prohibited would adversely affect commercial and recreational fishing activities. The limitation (Alternative 3) and prohibition (Alternative 4) of spear fishing within the park, and the elimination of the 2-day recreational lobster sport season (Alternatives 3 and 4) would adversely affect levels of recreational fishing activity within the park as well as incrementally decrease indirect revenues for businesses that service the fishers. Additionally, several of the park-specific management actions could potentially significantly affect levels of expenditures by recreational fishers among a variety of support businesses. No other unavoidable adverse impacts are anticipated.

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IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

All of the action alternatives (2, 3, and 4) would entail increasing levels of park expenditure, primarily through the necessity for additional law enforcement, education, and coordination efforts associated with the action alternatives. It is assumed that to effectively manage and educate park visitors and enforce park rules, all of the action alternatives would necessitate the hiring of additional park staff as well as training and expenditure for education and enforcement. This expansion of staff and expenditure would occur on an ongoing basis.

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RELATIONSHIPS BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

All of the action alternatives to some degree seek to balance the current and projected levels of commercial and recreational park usage with the long-term protection and preservation of park resources. Alternative 2 would involve only minor changes to existing commercial and recreational fishing activities within the park through the introduction and continuation of management measures designed to enhance the existing visitor experience, while still protecting the integrity of the overall fishery resource base. Alternatives 3, and particularly 4, emphasize a greater level of natural resource protection by managing commercial and recreational fishing activities to a much higher degree.

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ENVIRONMENTAL JUSTICE

Minority populations are present across Miami-Dade County, mainly within the northern half of the county and more limited in the south, and are present within the cities of Homestead and Florida City. Low-income populations are generally less widespread within the northern portion of the county and are more prevalent in the south, located within the cities of Homestead and Florida City but also present in more sparsely populated areas to the northeast of Homestead and adjacent to Highway 1.

The alternatives would not limit general park access to individuals associated with commercial and recreational fishing activities; all current methods used by commercial and recreational fishers to gain access to the park, such as county parks or marinas access, would remain as is. Provisions within several alternatives, however, may seek to limit access or manage commercial and/or recreational fishing activities within specific areas of the park. As noted in the affected environment section, very different fisheries are present in different areas of the park, with groups and/or communities associated with each of the fisheries differing by degree. Within the recreational fishery, for example, a very different population is engaged in the shoreline fishery than in the guided sport fish fishery, with the shoreline fishers more likely to be drawn from low-income and/or minority populations and more likely to retain their catch for subsistence. Depending on the specific area of fishery closure, environmental justice concerns may be triggered, but in the absence of specific plans such impacts cannot be determined. The fees for an annual Special Use Permit for commercial fishers operating within the park, and a recreational boat use permit for recreational fishers fishing from boats, while incrementally economically adverse from the perspective of the fishers themselves, are considered to be nominal. Aside from potential differential impacts based on specific area closures, impacts to local or regional low-income populations or minority populations related to the various alternatives would not be disproportional in nature; therefore, no environmental justice impacts related to the proposed alternatives would occur.

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