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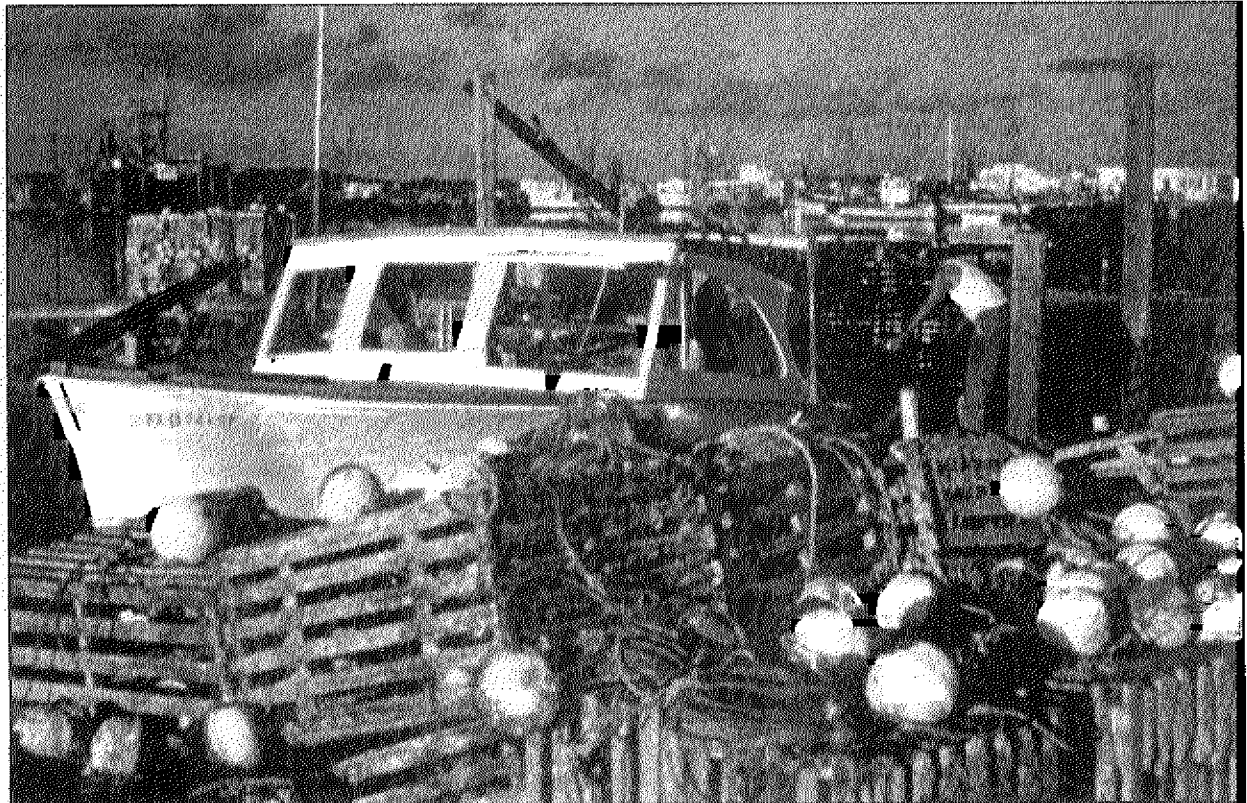
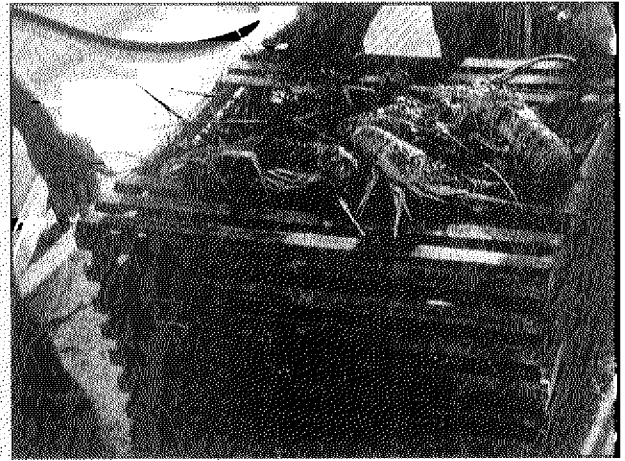
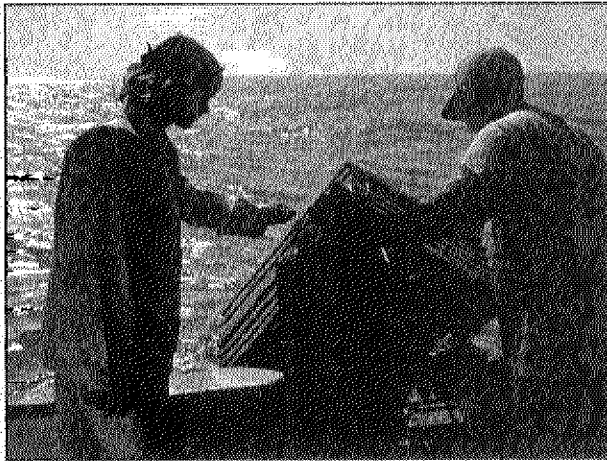
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Florida's Spiny Lobster

Trap Certification Program

by

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TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES.....	iii
LIST OF FIGURES	v
ACKNOWLEDGMENTS	vi
EXECUTIVE SUMMARY	vii
1. INTRODUCTION	1
1.1. Management of the Commercial Spiny Lobster Fishery.....	1
1.2. Purpose of the Study	3
2. HISTORY OF THE FISHERY	5
2.1. Florida's Spiny Lobster Fishery	5
2.1.1. Catch and Effort Statistics	5
2.1.2. Seasonal Landing Patterns	10
2.2. A History of Regulations.....	12
2.2.1. The 1910s through 1950s.....	12
2.2.2. The 1960s and 1970s	14
2.2.3. The 1980s until 1992	15
2.3. Non-management Events That Have Affected the Industry	15
3. MANAGEMENT OF THE TRAP CERTIFICATE PROGRAM	18
3.1. Summary of Legislative Provisions	18
3.1.1. Eligibility and Initial Certificate Allocation.....	18
3.1.2. Restrictions on the Number of Certificates Owned	19
3.1.3. Ownership Transferability	20
3.1.4. Fees and Surcharges	20
3.1.5. Prohibitions and Penalties.....	21
3.1.6. Trap Reductions.....	22
3.2. Projected Administrative Costs and Revenues.....	23
3.2.1. TCP Costs Projected for the First Year	23
3.2.2. TCP Revenues Projected for the First Year.....	24
3.2.3. TCP Net Revenue Projections for the Initial Three Years of the Program	25
3.3. Changes in the Number of Certificates under the TCP	25

4. EVALUATION OF CERTIFICATE TRANSFERS	28
4.1. Types of Certificates	28
4.2. Annual Certificate Balance	28
4.3. Concentration of Certificate Holdings	29
4.4. Number of Participants.....	32
4.5. Entry and Exit Behavior.....	33
4.6. Certificate Transfers.....	34
4.6.1. Number of Transactions	34
4.6.2. Volume of Certificates Traded	35
4.6.3. Number of Individuals Transacting	37
4.7. Certificate Holdings by Geographic Region	39
4.8. Certificate Prices	40
4.8.1. Certificate Prices Reported to the FDEP	40
4.8.2. The Average Transaction.....	44
4.8.3. Reported Leasing and Expected Sales/Purchase Activity from a Survey of Industry Participants in 1996	45
4.8.4. Comparison of Projected and Reported Certificate Prices to their Estimated Value	47
4.8.5. Summary.....	49
5. PROGRAM ADMINISTRATION	50
5.1. Reported TCP Revenues	50
5.2. Reported TCP Costs.....	53
5.3. Net Revenues 1995-97 with Projections through 2001	55
6. SUMMARY AND SUGGESTED PROGRAM REVISIONS	58
6.1. Summary of Major Findings	58
6.2. Proposed Revisions for the Trap Certificate Program.....	60
REFERENCES	65
APPENDICES	69
Appendix A: Account Balance by Fiscal Status, 1993-99	70
Appendix B: Alternative Measures of Participation, 1993-99	71

LIST OF TABLES

<u>Number</u>	<u>Page</u>
Table 2-1. Chronology of Significant Regulations for the Commercial Spiny Lobster Fishery in Florida, 1919-91.....	13
Table 2-2. Chronology of Non-management Events	16
Table 3-1. TCP Costs Projected by the DNR (1991) for the First Fiscal Year.....	23
Table 3-2. TCP Revenues Projected by DNR (1991) for the First Fiscal Year.....	24
Table 3-3. TCP Net Revenue Projections for the First Three Years of the Program	25
Table 3-4. TCP Activity Log from 1991-92 through 1998-99	26
Table 4-1. Number of Certificates by Type, 1993-99.....	29
Table 4-2. The CR_{50} , CR_{100} , and CR_{500} for the Spiny Lobster Fishery, 1993-99.....	30
Table 4-3. Between Year Entry and Exit, 1993-99.....	34
Table 4-5. Total Number of Certificates Transferred by Type, 1994-98.....	35
Table 4-6. Average Number of Certificates Transferred by Type, 1994-98	36
Table 4-7. Number of Unique Buyers and Sellers Involved in a Transaction, 1994-98..	37
Table 4-8. Proportion of Sellers and Buyers who Transacted at least Twice, 1994-98...	38
Table 4-9. Number of Certificates held by Top Five Counties in 1993 and 1998.....	39
Table 4-10. Reported and Average Transfer Prices by Certificate Type, 1994-98	41
Table 4-11. Percentage of Transactions with Base Prices by Certificate Type, 1994-98	42
Table 4-12. Reported Minimum and Average Trimmed Transfer Prices by Certificate Type, 1994-98	43
Table 4-13. Average Number and Cost of Certificates Transferred by Type, 1994-98 ..	44
Table 4-14. Reported Leasing and Expected Sales/Purchase Activity	46
Table 4-15. The Expected Short-run and Observed Transfer Prices, 1993-96.....	48
Table 5-1. Reported TCP Revenues, Fiscal Years 1992-93 to 1996-97.....	51
Table 5-2. Comparison of Projected to Actual Cost Estimates in 1995	53
Table 5-3. Actual Costs Incurred by the Division of Marine Resources for the TCP, 1994-95 to 1996-97	54
Table 5-4. Estimated TCP Net Revenues Excluding Law Enforcement and the Marine Fisheries Commission, 1995-97.....	55

Table 5-5. Projected TCP Net Revenues Excluding Law Enforcement and the Marine Fisheries Commission, 1999-2001	56
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LIST OF FIGURES

<u>Number</u>	<u>Page</u>
Figure 1-1. Organizational Structure for Fisheries Management in Florida.....	2
Figure 2-1. Commercial Landings in the Florida Spiny Lobster Fishery, 1939-96.....	6
Figure 2-2. Vessels and Traps in the Florida Spiny Lobster Fishery, 1951-96	7
Figure 2-3. Total Number of Vessels and Average Traps per Vessel, 1951-96	8
Figure 2-4. Number of Traps and Pounds per Trap, 1951-96.....	8
Figure 2-5. Florida Commercial Landings by Coast, 1961-96	9
Figure 2-6. Traps and Average Yields for Florida's West Coast, 1961-96	10
Figure 2-7. Average Intraseason Distribution of Commercial Landings, 1961-96	11
Figure 4-1. Concentration Ratios at Increasing Numbers of Participants Ordered by the Number of Certificates Owned during the 1998-99 Season.....	31
Figure 4-2. Number of TCP Participants and Average Certificate Holdings, 1993-99 ...	33
Figure 4-3. Percentage of Sellers and Buyers by Number of Transactions (n)	38
Figure 4-4. Geographic Dispersion of Certificates in the Florida Keys, 1993 and 1997	40

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Opinions expressed in this report should not be interpreted as the official position of Florida Sea Grant, the Marine Fisheries Commission, or the Florida Department of Environmental Protection. The authors bear sole responsibility for any errors.

EXECUTIVE SUMMARY

The trap certificate program (TCP) for the commercial spiny lobster (*Panulirus argus*) fishery in Florida was established in 1992 with the passage of Florida Statute 370.142 by the Florida Legislature. The program was needed, according to Florida Statute 370.142(1), because the industry faced the following problems:

Due to rapid growth, the spiny lobster fishery is experiencing increased congestion and conflict on the water, excessive mortality of undersized lobsters, a declining yield per trap, and public concern over petroleum and debris pollution from existing traps.

Consequently, the goal of the TCP was "...to stabilize the fishery by reducing the total number of traps, which should increase the yield per trap and therefore maintain or increase overall catch levels" (Florida Statute 370.142(1)). Under the TCP, commercial qualified fishers were issued certificates – with corresponding tags for each trap – that could be sold, in all or part, to other fishers. The Florida Marine Fisheries Commission (MFC) was delegated the authority to determine the total allowable number of certificates.

The purpose of this assessment was to review the performance of the TCP. This review included (1) administrative costs incurred, (2) revenues collected, and (3) the transfer of certificate ownership and use. Actual costs and revenues were compared to initial estimates to determine whether the TCP has fulfilled initial expectations about its viability as a regulatory mechanism. Since TCP revenues are determined (in part) by the market for certificates, it was also necessary to evaluate the volume of certificate transfers and the reported transfer prices.

In summary, the Florida spiny lobster TCP has fulfilled the initial expectations of the program by reducing the total number of traps and increasing the yield per trap. From the 1991-92 to 1998-99 seasons, the total number of traps – an indication of commercial fishing effort – has declined by approximately 42 percent. Since the inception of the program in 1992, the MFC reduced the number of certificates by 27 percent from a high of approximately 747,000 in 1993-94 to a low of 544,000 in 1998-99. The average catch-per-trap has increased from below 7 pounds to greater than 12 pounds during the program. The following conclusions resulted from the TCP performance evaluation:

- Reductions in the total number of traps in the spiny lobster fishery increased the average yield per trap but did not effect overall catch levels.
- The volume of certificate transfers – where ownership was exchanged – was larger than projected, ranging from 6 to 12 percent of the total number of certificates available in any given year. The majority of transfers involved the sale of certificates by the original owner (i.e., Type A-1) to a non-family member.
- Certificate reductions have eliminated 27 percent of the available certificates. Certificate transferability has resulted in a 42 percent reduction in the number of certificate holders. Consequently, concentration of certificate ownership has

increased under the program. However, the concentration is well below comparable levels of market concentration in many U.S. industries.

- The TCP has not affected the ranking of the top five counties in terms of the number of certificates held. Owners in Monroe and Dade Counties, the two largest, increased their collective holdings from 92.5 percent to 95 percent of the total number of certificates available. In these counties, mandated reductions were offset by transfers to increase certificate balances.
- Average reported transfer prices for Type A-1 certificates (sold outside the immediate family and subject to a surcharge) and Type B certificates (not subject to a surcharge) increased annually. The average price of a B certificate was considerably higher than the price of an A-1 certificate, although the number of B transfers was smaller.
- Based on the annual average yield per trap, ex-vessel prices for spiny lobster, and a revenue adjustment factor that accounts for costs, the average annual reported transfer prices were less than their expected value. These estimates of expected value, however, were sensitive to a number of factors including: the discount rate, the anticipated duration of the program, and profits per trap.
- Initial estimates of the administrative costs of the TCP for the Florida Department of Environmental Protection (FDEP) were too low due to unanticipated increases in tag production and distribution costs and unaccounted for enforcement expenses.
- Initial estimates of the total revenues derived from the TCP were too high due to overestimated surcharge revenues.
- Despite higher costs and lower revenues than originally estimated, the TCP has resulted in net surpluses for the FDEP (excluding expenses incurred by the Florida Marine Patrol and MFC). These surpluses are expected to decline, and possibly become deficits, as revenues fall due to lower certificate numbers and fewer transfers (or if enforcement costs and MFC administrative expenses are included).

The analysis identified several factors that have inhibited the performance and could potentially jeopardize the overall success of the Florida spiny lobster TCP. These factors have resulted in the following management proposals:

- (1) Distribute information on certificate transfers, transfer prices, and average trap yields.
- (2) Eliminate the 25 percent surcharge on sales of A-1 certificates out of the family.
- (3) Establish a reduction target for the total number of certificates allowed in the fishery.
- (4) Eliminate the reallocation of abandoned certificates during years of no reductions.
- (5) Future reductions in the total number of spiny lobster trap certificates could be made through a certificate buy-out program administered by FDEP.
- (6) Establish restrictions on the total number of harvesters in the commercial spiny lobster fishery so that entry by non-trap gear users is regulated.
- (7) Restrict the total number of recreational harvesters or formally allocate the projected total landings between commercial and recreational harvesters in each season.
- (8) Develop and implement a mechanism to assess and collect an equitable rent per trap as stipulated in the initial legislation that established the TCP.

The Performance of Florida's Spiny Lobster Trap Certificate Program

1. INTRODUCTION

1.1. Management of the Commercial Spiny Lobster Fishery

A trap certificate program (TCP) for the commercial spiny lobster (*Panulirus argus*) fishery in Florida was established in 1992 with the passage of Florida Statute 370.142 by the Florida Legislature. The program was needed, according to Florida Statute 370.142(1), because the industry faced the following problems:

Due to rapid growth, the spiny lobster fishery is experiencing increased congestion and conflict on the water, excessive mortality of undersized lobsters, a declining yield per trap, and public concern over petroleum and debris pollution from existing traps.

Consequently, the stated goal of the TCP is "...to stabilize the fishery by reducing the total number of traps, which should increase the yield per trap and therefore maintain or increase overall catch levels" (Florida Statute 370.142(1)).

Under the TCP, qualified commercial fishers were issued a specific number of certificates, each allowing the use of one trap, based on reported landings in previous seasons. Each year, upon payment of the annual certificate fee, the certificate holder receives tags – that are numbered and embossed with the owner's identification number – to affix on their traps (assuming all the necessary license, endorsement, and permits have been obtained). Certificate owners are allowed to sell part or all of their certificate holdings to other fishers. The total number of certificates available during each season and, therefore, the total number of certificates owned by each individual, can be periodically reduced to meet the goals of the program.

The TCP, which was developed with the cooperation of the commercial fishing industry (Orbach and Johnson), ended an era of open-access management of the spiny lobster fishery in Florida. It established one of the first individual transferable permit programs in the United States. In recent years, the concept of transferable rights to fishery resources has received considerable attention in the academic and trade journal press as an alternative to open-access management (e.g., Buck; Macinko; Scott; Townsend; Squires, Kirkley, and Tisdell; Gauvin, Ward, and Burgess). In addition, similar management programs have been implemented in the United States and other countries (Neher, Arnason, and Mollett). Despite the increasing use – and suggested use – of such programs, relatively few individual transferable rights-based programs have

been assessed to determine (1) whether they have (or could) achieve their objectives, *and* (2) the administrative revenues and costs associated with the program.

The Florida Department of Environmental Protection (FDEP) has administrative responsibility for the spiny lobster TCP. Although some spiny lobster harvests occur in federal waters, regulatory authority for this fishery was delegated to the State of Florida beginning June 1, 1994 (50 CFR Part 640, U.S. Commerce Department). In addition, since commercial landings from federal waters north of Florida have been negligible, the National Marine Fisheries Service has recently proposed to eliminate the federal FMP (Helm).

The FDEP is Florida's principal environmental and natural resources agency. The agency was created in 1993 from the merger of the Department of Natural Resources and the Department of Environmental Regulation. The FDEP is responsible for administering and enforcing all saltwater fisheries regulations. The FDEP is guided by recommendations and rules established by the Marine Fisheries Commission (MFC). Although the MFC is an independent organization, it receives funding from fees assessed and collected by the FDEP. The governmental entities currently involved in the administration, oversight, and enforcement of Florida's spiny lobster TCP are shown in Figure 1-1.

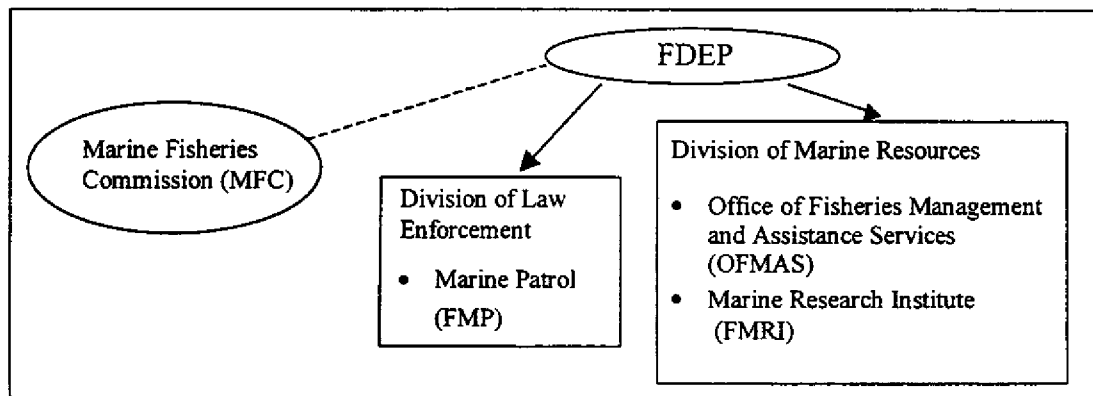


Figure 1-1. Organizational Structure for Fisheries Management in Florida

The MFC, consisting of seven individuals who have resided in the state for at least five years, "...is delegated full rulemaking authority over marine life, with the exception of endangered species, subject to final approval by the Governor and Cabinet" (Florida Statute 370.027). Following specific authority given by the legislation creating the spiny lobster TCP, the MFC developed the Spiny and Slipper Lobster Management Plan (Florida Administrative Code, Chapter 46-24). According to this management plan, It is the goal of the Commission to substantially reduce the mortality of undersize spiny lobster in the fishery, by reducing the number of traps used in the fishery to the lowest number which will maintain or increase

overall catch levels, promote economic efficiency in the fishery, and conserve natural resources. (Chapter 46-24.001(5))

For the commercial spiny lobster fishery, the management plan sets minimum size limits (Chapter 46-24.003), seasons (Chapter 46-24.005), gear restrictions (Chapter 46-24.006), and the trap reduction schedule (Chapter 46-24.009).

Officers with the Florida Marine Patrol (FMP) “are constituted law enforcement officers of this state with full power to investigate and arrest for any violation of the laws of this state and the rules and regulations of the department” (Florida Statute 370.021(5)). In particular, the FMP is responsible for enforcing the regulations of the Florida Administrative Code as specified by the MFC and the Florida Legislature. For the spiny lobster fishery, the FMP is also responsible for enforcing the regulations established by the FDEP that support the TCP (Chapter 62R-18). The FMP enforces regulations for all fisheries in Florida and, therefore, is not responsible only for the spiny lobster fishery or the TCP.

The Office of Fisheries Management and Assistance Services (OFMAS) is responsible for administering the TCP. This office monitors certificate numbers, issues trap tags (and the appropriate licenses, permits, and endorsements), and collects fees. The OFMAS also contracts for the production of the trap tags and retrieval of traps that remain in the water during the closed season as required by law (Florida Statute 370.143). This office may also be involved in the suspension or revocation of licenses and the determination of appropriate civil penalties against violators.

The Florida Marine Research Institute (FMRI) conducts research on all Florida fisheries. For the TCP, this office conducts stock assessments, compiles landings statistics, and estimates total effort (commercial and recreational) in the fishery. This function is particularly important given that the goals of the MFC regarding the TCP – as contained in Chapter 46-24.001(5) – depend on estimates of (1) the mortality of undersized lobsters; (2) the total number of traps; (3) the yield per trap (i.e., the average pounds landed per trap per year); and (4) overall catch levels (i.e., total annual pounds landed).

1.2. Purpose of the Study

The TCP is a unique program for fisheries management in the United States for many reasons. First, the TCP is one of just a few domestic fishery management programs with individual, transferable effort limitations (Buck). Second, fees can be set to cover the cost of management. Third, rents can be collected through an additional fee. An assessment of this program is important since it can offer valuable information for similar programs being proposed for other trap fisheries including Georgia blue crab, Maryland blue crab, and Florida stone crab (Evans).

The purpose of this assessment is to review the performance of the TCP using historical catch and effort data and changes in the number of certificates held by each individual since the program began (as provided by the FDEP). This review includes administrative costs incurred by the FDEP, revenues collected, and the transfer of certificate ownership since the TCP was enacted. Actual costs and revenues are compared to initial projections to determine whether the TCP has fulfilled initial expectations about its viability as a self-financing regulatory mechanism. The volume of certificate transfers and the reported transfer prices are evaluated to determine whether transferability has contributed to the overall performance of the TCP. In addition to the financial self-sufficiency of the program and characteristics of the transfer market, changes in certificate concentration, entry and exit behavior, and geographic distribution of certificates will also be evaluated.

In this report we do not address the question of whether trap reductions authorized by the MFC – in accordance with the TCP – has fully achieved the goals of the initial legislation. Related issues are considered in detail in a companion report titled *Bioeconomic Models of the Florida Commercial Spiny Lobster Fishery* (Florida Sea Grant Report No. 117). We also do not reconsider issues relating to the initial allocation of certificates – although we present a more complete description of the process – which have already been evaluated (e.g., Hunt). In addition, we do not address the effects of the program on the overall characteristics of the commercial fleet (such as average vessel and engine size). Finally, we do not consider field enforcement issues such as the deployment of illegal (i.e., untagged) traps, trap poaching, and compliance with regulations.

The next section of this report provides an overview of the Florida spiny lobster fishery and a summary of regulations and other events that have affected the fishery since the 1920s. Section 3 summarizes the legislative provisions of the TCP, the initial projections for administrative costs and revenues, and changes in the number of certificates since the inception of the TCP. Section 4 evaluates certificate transfers that have occurred through the 1998-99 season including the number of transactions, volume of certificates traded, market concentration, and transfer prices. Section 5 provides a comparison of projected and actual costs and revenues associated with the program. The final section provides a summary of major conclusions about the performance of the TCP that are addressed in this report. We also offer some proposals for changes in the TCP to improve the overall performance of the program

2. HISTORY OF THE FISHERY

The spiny lobster fishery in Florida began in the late 1800s as a bait source for reef fish (Labisky, Gregory, and Conti). At that time, lobsters were primarily harvested using bully nets from skiffs. The consumption market began in the 1910s, but the use of spiny lobsters for bait continued through the 1920s. The first regulations on the fishery were established in 1919 and pertained only to harvests for the consumption market. The bait industry remained unregulated and unmonitored.

Since the 1920s, several social, political, and technological changes have affected the fishery (Labisky, Gregory, and Conti). In addition, the fishery management approach changed. Given the number and variety of changes, it is useful to examine historical impacts on landings and effort. For example, policy changes by foreign governments, technological and infrastructure advances, and environmental phenomena have all had noticeable effects on the industry.

This section begins with a review of the commercial spiny lobster fishery in Florida. The historical overview is followed by a summary of regulations from the 1910s until the implementation of the TCP in 1992.¹ Lastly, potentially influential non-management factors are reviewed.

2.1. Florida's Spiny Lobster Fishery

In 1996, the commercial fishery in Florida landed approximately 7.4 million pounds (whole weight) of spiny lobster with an ex-vessel value of nearly \$29 million (*Fisheries of the United States, 1996*; NMFS). The fishery in Florida accounted for 90 percent of total U.S. catch and 11.4 percent of the total value of commercial landings in Florida. The majority of the commercial harvest – approximately 90 percent – occurred near the Florida Keys using wooden slat traps. Bully nets and SCUBA divers also harvested lobsters for the commercial market, but to a much lesser extent; harvest from this effort accounted for four percent of total landings. Unknown and miscellaneous gear accounted for the remaining six percent of landings. Recreational harvests amounted to an additional 2 million pounds (Hunt et al. 1998).

2.1.1. Catch and Effort Statistics

The State of Florida has collected annual information on spiny lobster landings since the 1939 season (July 1938 through March 1939) and effort – represented by the number of vessels and traps (i.e., capital investment) – since the 1951 season (1950-51).²

¹ Although approved by the Florida legislature in 1990, certificates were not issued under the TCP until 1992 (A. Cordero, FDEP, personal communication).

² Before 1939, landings were reported every two years since the 1925-1926 calendar years.

Total landings for the 1938-39 through 1995-96 seasons – obtained from papers by Labisky, Conti, and Gregory, the FDEP, and NMFS – are shown in Figure 2-1. Between 1939 to 1996, landings increased from approximately 400,000 pounds to over 7 million pounds (whole weight).

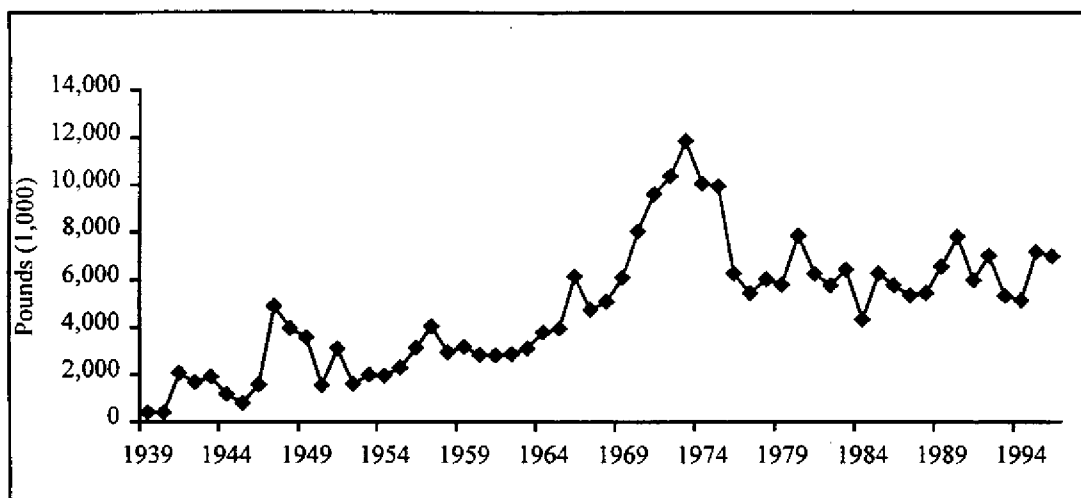


Figure 2-1. Commercial Landings in the Florida Spiny Lobster Fishery, 1939-96

During this period – from 1939 to 1996 – landings peaked twice, in 1947 and 1973. The historical landings of the early 1970s (which exceeded 10 million pounds annually) have been attributed, however, to effort expended in Bahamian waters. Since 1975, annual commercial landings have fluctuated around 6 million pounds, with no apparent trend. Following a presentation of vessel numbers, trap numbers, the average number of traps per vessel, and the average number of pounds landed per trap reported in Florida from 1951 to 1996, statistics for Florida's West Coast are presented. The West Coast data excludes landings from the Bahamas – which were recorded on the East Coast – and, therefore, may be a more accurate representation of the fishery (Hunt; Harper).

The number of licensed vessels and number of reported traps from 1951 to 1996 are shown in Figure 2-2. The number of vessels and traps increased significantly through 1976. The total number of vessels in the industry increased from 102 in the early 1950s to an historical high of 823 in 1976. Likewise, the number of traps also increased significantly; during the 1950-51 season, there were approximately 12,000 traps. By 1976, the number of traps reached 520,000.

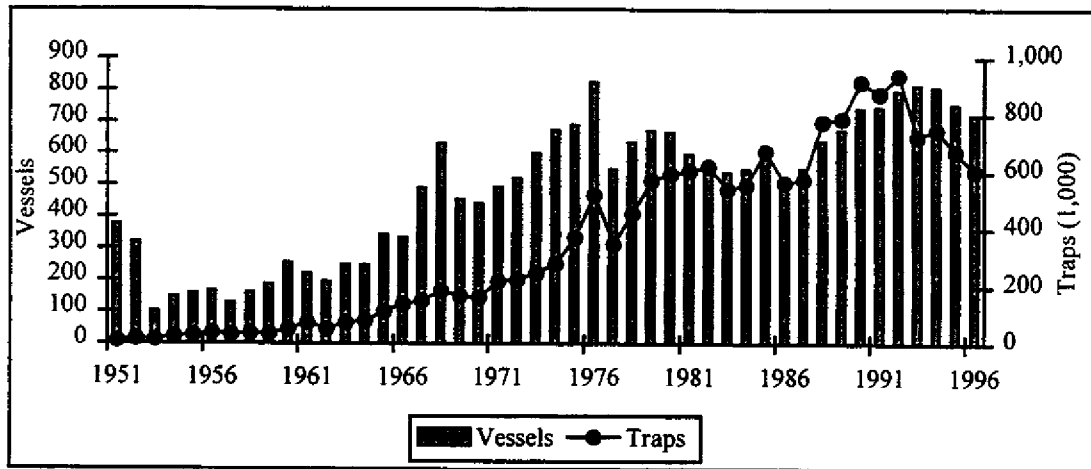


Figure 2-2. Vessels and Traps in the Florida Spiny Lobster Fishery, 1951-96

Since 1976, the number of vessels and traps have followed similar patterns of increases and declines; the most notable trend is the decline since 1992, which was the year the TCP was implemented. Under the TCP, the number of traps has been reduced from approximately 940,000 – according to studies by Muller et al. and Harper – to 544,000 (FDEP). Even though trap technology and design has changed little over time – making comparisons between years valid – the average vessel increased in size and power and is equipped with improved instrumentation and other modern advancements (Labisky, Gregory, and Conti). Consequently, comparing vessel numbers across time may underestimate the total increase in fishing power.

Aside from trends in nominal effort, such as presented in Figure 2-2, it is also interesting to evaluate whether firm size – represented by the number of traps per vessel – has changed. The number of vessels and average number of traps per vessel, from 1951 through 1996, are shown in Figure 2-3. Overall, firm size has increased dramatically; from 1955 to until the early 1990s, the average number of traps per vessel increased from 256 to over 1,200. After the TCP was implemented in 1993, however, the number of vessels and the average number of traps per vessel both declined. The reduction in the number of vessels may reflect exit behavior as owners decide to enter other, less restrictive, fisheries. The decline in average trap holdings per vessel reflects the reduction in traps under the TCP. The average trap numbers would be expected to fall – despite certificate transferability that can increase an individual's holdings – given that (as of the 1998-99 season) the MFC has mandated reductions equal to approximately 42 percent of the total number of traps that were used in 1991-92.

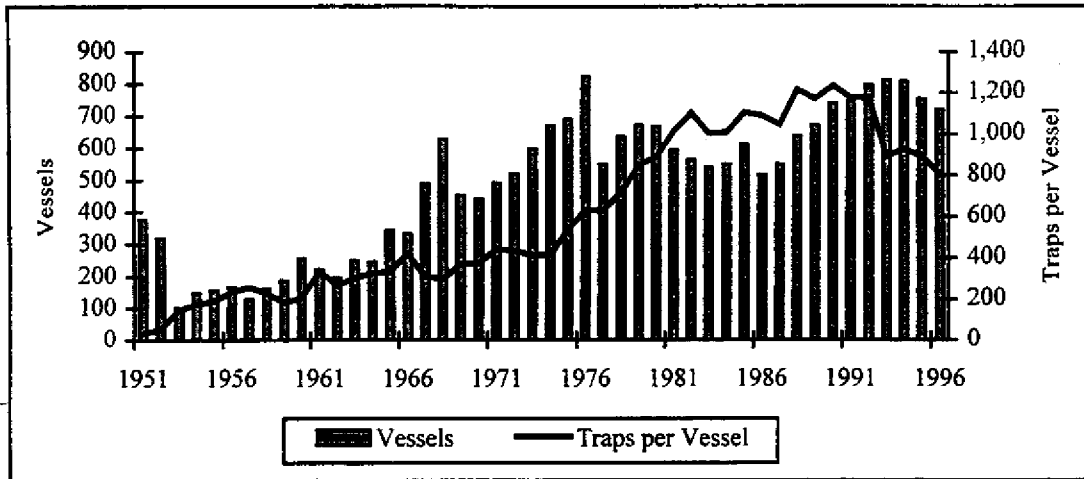


Figure 2-3. Total Number of Vessels and Average Traps per Vessel, 1951-96

The total annual landings (Figure 2-1) and total annual trap use (Figure 2-2) can also be used to determine the annual average yield (i.e., pounds landed) per trap. Average trap yields – also known as the catch per unit effort or CPUE – from 1951 to 1996 are shown in Figure 2-4. In general, the increase in number of traps from 1951 until 1992 coincided with a decline in the average yield per trap; this inverse relationship is most noticeable prior to the 1980s. At the extreme, in 1952, 17,000 traps each harvested approximately 180 pounds. When trap numbers peaked in 1992, however, 939,000 traps harvested just 7 pounds each. Since 1975, average trap yields have remained relatively stable (given the historic highs of the 1950s) at just under 10 pounds, despite a significant increase in trap numbers. Since variability in one series is associated with stability in the other, yields may not be solely affected by trap density.

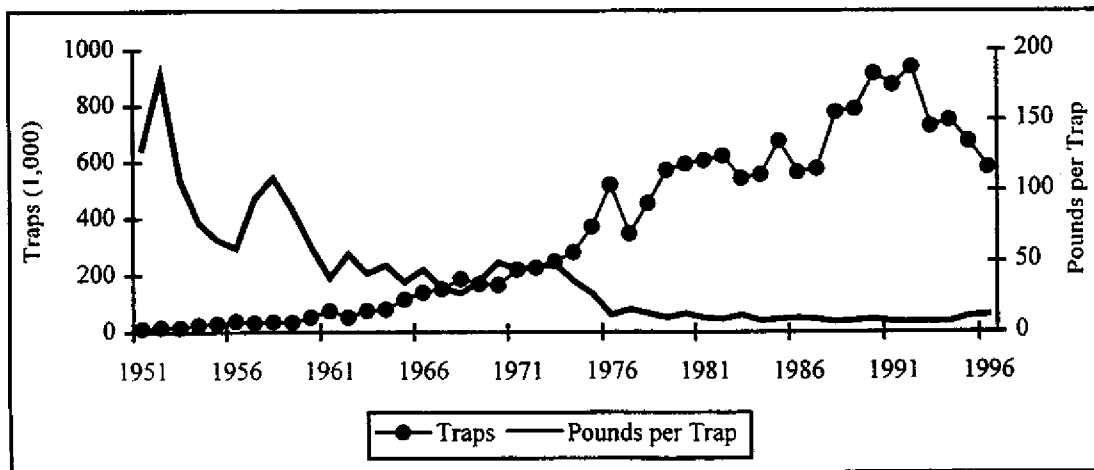


Figure 2-4. Number of Traps and Pounds per Trap, 1951-96

As stated earlier (following the discussion of Figure 2-1), Florida landings before 1975 were not exclusively from domestic waters. One way to examine the extent of foreign-based landings is to compare landings by coast. This is because foreign-based catches – primarily from the Bahamas – were landed and recorded only on Florida's East Coast (Harper; Hunt). Total landings and landings by coast from the 1960-61 to 1995-96 seasons – the only period during which this information is available – are shown in Figure 2-5. According to this figure, landings from the East Coast only significantly affected total landings during the five-year period between 1971 and 1975. During this time, the East Coast and total landings peaked while the West Coast landings – which includes Monroe County and the Florida Keys – dropped.³

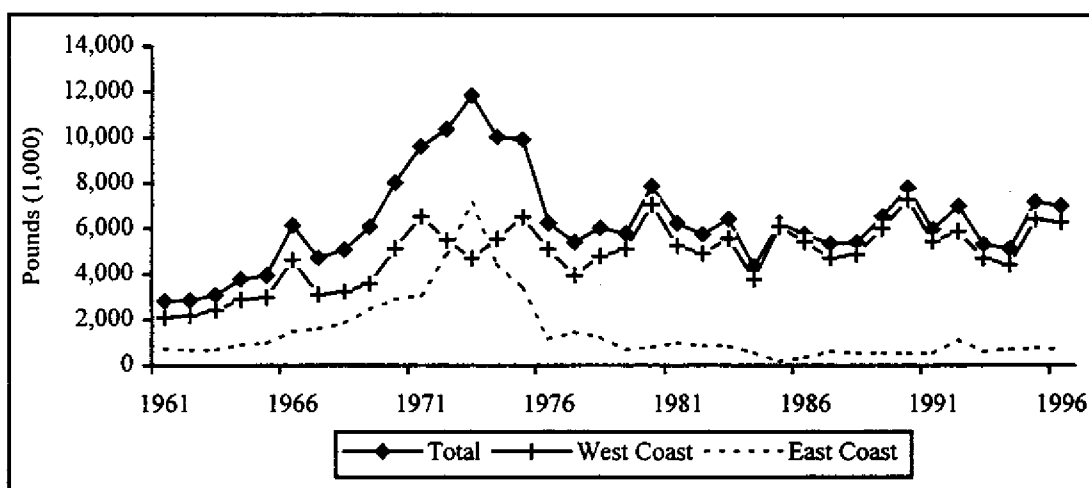


Figure 2-5. Florida Commercial Landings by Coast, 1961-96

With the exception of the 1971-75 period, the total and West Coast landings closely parallel one another. This similarity – in trend and magnitude – indicates that the vast majority of landings in each year have occurred on Florida's West Coast (which represents harvests from domestic waters only).

An important variable in the assessment of the TCP – according to the goals of the management plan – is the average annual yield per trap (Florida Administrative Code, Chapter 46-24). The statewide trend in yield per trap was presented in Figure 2-4; however, given the possible influence of foreign landings, this figure is re-created – in Figure 2-6 – using only the data from Florida's West Coast. From the 1960-61 to 1995-96 season, the trends in trap numbers and pounds per trap for the West Coast are similar

³ Biological studies that rely on historical catch and effort data may find it necessary to exclude all or part of East Coast landings prior to 1976 – for example, by using the mean of the 4-5 year period before and after the period in question – to account for landings from Bahamian waters (J. Hunt, FMRI, personal communication).

to the total fishery (Figure 2-4); there was a general, inverse relationship between trap numbers and average yield.

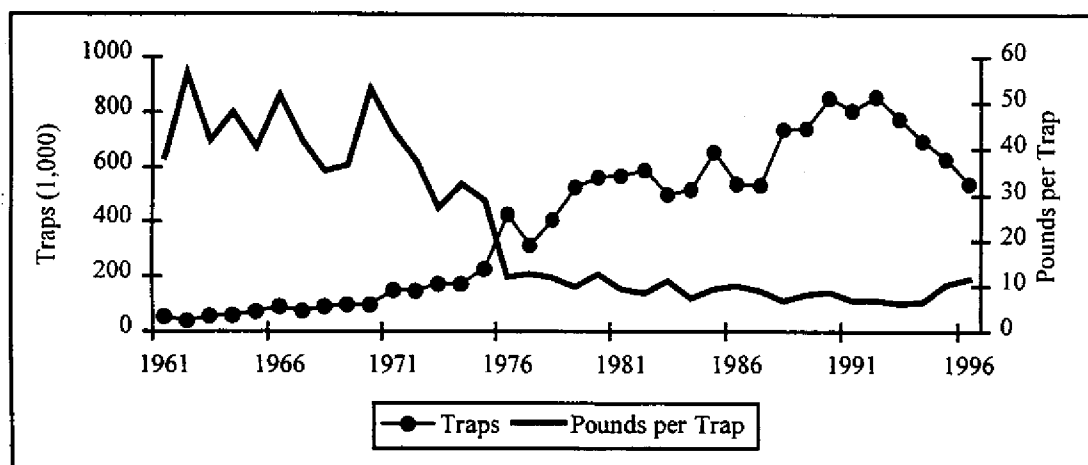


Figure 2-6. Traps and Average Yields for Florida's West Coast, 1961-96

From 1976 to 1992, the number of traps on the West Coast increased approximately 170 percent (from 315,000 to over 850,000) (NMFS). The trap reductions since 1992 are due to the trap certificate program (see Table 3-4 for official certificate balances during the program). Since 1976, trap yield has averaged 9.2 pounds per year and experienced little variation (standard deviation = 2.1), although a decline from 1976 to the early 1990s is observable. Trap yields have, however, begun to increase in recent years. In particular, the lowest trap yields of approximately 7 pounds per season have increased to over 12 pounds per season in 1996-97, a level last observed in the late 1970s (Hunt et al. 1998).

2.1.2. Seasonal Landing Patterns

The intraseason pattern of landings has changed over time. The proportion of annual landings occurring during the first two months – that is, August and September – of the 8-month season have increased. The proportion of annual landings occurring in (1) August and September, (2) October and November, and (3) December through March – from the 1960-61 through 1995-96 seasons as reported by Harper – is shown in Figure 2-7. From 1961 through 1974 – the first 14 seasons for which there is monthly data – the proportion of annual landings from the first two months of the season never exceeded 40 percent (and was closer to 30 percent in most years). Since 1988, however, the proportion of annual landings from the first two months of the season have never fallen below 40 percent (46.2 percent to be exact). In fact, with the exception of 1987, the proportion of landings in August and September in each of the last 15 seasons has exceeded 40 percent. The trend toward increasing early season exploitation is, most likely, the result of increased capital investment in the fishery – that is, the number of

traps and vessels as shown in Figure 2-2 – and the corresponding congestion on the fishing grounds. This trend has not changed since the implementation of the TCP in 1993.

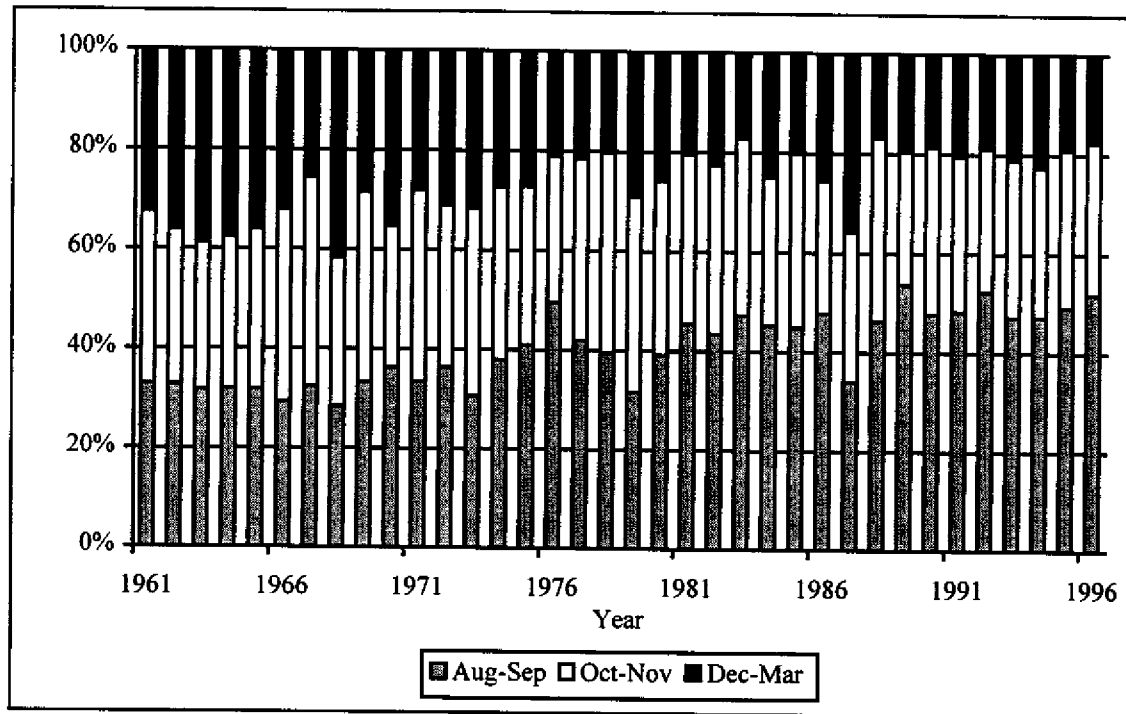


Figure 2-7. Average Intraseason Distribution of Commercial Landings, 1961-96

In addition to showing that harvests have become more compressed during the initial two months of the season, Figure 2-7 also reveals that the proportion of annual landings during the latter half of the season has fallen. Until 1976, the proportion of total landings occurring from December through March was well above 20 percent in each year (in most years it was above 30 percent). Conversely, since 1988, the proportion of total landings from December through March in each of the last nine years was generally less than 20 percent (hovering between 17.7 and 22.7 percent). The recent decline in harvests from December to March may be the result of improved opportunities to participate in alternative fisheries – such as stone crab – from December to March. The participation in multiple fisheries by commercial spiny lobster fishermen was identified as early as 1976 by Prochaska and Williams. In addition, a recent survey found that the majority of trap certificate holders participated in both the spiny lobster and stone crab fisheries (Milon et al; Shviani and Milon).

2.2. A History of Regulations

Various regulatory approaches have been used to manage the commercial spiny lobster fishery. These regulations can be classified into five categories: (1) closed seasons, (2) minimum size, (3) gear types, (4) permits, and (5) miscellaneous. The historical implementation of these regulations, from the 1920s to the early 1990s, is summarized in Table 2-1.

2.2.1. The 1910s through 1950s

This period marked the beginning of management of the commercial harvest of spiny lobster in the United States. Regulations focused on protecting the stock using closed seasons and minimum size rules. The first regulation was implemented in 1919 when fishing was prohibited during March, April, and May. Two years later, this 93-day closed season was pushed back by three weeks after the spawning season was re-evaluated. In 1929, the closed season was extended to 123 days to prevent harvest during a period when lobsters were found to grow rapidly (i.e., late June through early July); fishing was now prohibited from March 21 through July 21. Although the fishing season was closed for 123 days (four months) out of each year until 1965, the timing of the season changed twice. In 1929, the season opened July 22. In 1953, the opening was delayed until August 16 – more than three weeks – but in 1955, the season opened on August 2 (still more than a week later than the original opening).

Minimum size rules were first established in 1929. Beginning with the 1929-30 season, lobsters weighing less than one pound had to be released. Although this regulation remained in effect until 1965, the size was redefined to a tail length measure of six inches in 1953. This change was made to increase compliance and enforcement since tail length violations were believed to be easier to identify.

In addition to these stock protection measures, permits were required to harvest more than 2 dozen lobsters beginning in the mid-1950s. These permits were principally to identify participation in the fishery since they were free and available to anyone.

During the 1950s – when the regulatory changes occurred – landings (Figure 2-1) and landings per trap (Figure 2-4) peaked twice, in 1951 and 1957 (the 1950-51 and 1956-57 seasons). Given that the regulatory changes occurred in 1953 and 1955, the increase in landings – and corresponding increase in average yields – do not appear to be related to the policy changes. In addition, the increased landings are not explained by changes in capital investment since vessel numbers actually dropped in 1953 and trap numbers remained stable throughout the 1950s. The lack of obvious effects by policies and capital investment during this decade indicates that the change in landings were caused by other factors such as an increase in effort – from increases in vessel size or power, use of other gear types, or longer fishing days – or natural biological variability.

Table 2-1. Chronology of Significant Regulations for the Commercial Spiny Lobster Fishery in Florida, 1919-91

Year	Closed Season ^a	Minimum Size	Gear	Permits	Other
1919	3/1-6/1				
1921	3/21-6/21				
1929	3/21-7/21	• 1 pound			
1953	4/15-8/15	• 6-inch tail		• permits issued beginning 1954-55	
1955	3/31-8/1	•			
1965	4/1-7/25	• 5.5-inch tail or 3-inch CL ^b	• marking: all gear permanently marked and color-coded to buoys • construction: ice cans and drums allowed; wood traps less than 12 cu. ft. with wire on sides only; no hooks or spears (barb or barbles) ^c • placement: <20 traps per trot-line	• permits numbered • additional permit to separate head & tail	• traps allowed to soak during closed season (10 days before, 5 days after) • release egg-bearers
1969		• 6-inch tail if tail separated			
1970				• permit fee: \$50	
1977					• hold up to 200 shorts ^d • 50 shorts or 1 per trap • handling of shorts
1987	4/1-8/5		• traps: maximum of 2,000 each • nets: prohibited except hand-held		
1988			• traps: number based on historic catch, must have tag attached	• 3-year moratorium	
1991					

Sources: Prochaska and Baarda; Labisky, Gregory, and Conti; Simmons; Zuboy, Jones, and Costello; Hoar.

^a The season refers to the commercial sector harvesting for consumptive use.

^b Carapace length (CL) measures the hard shell or "head." One pound is approximately equal to 3 1/8 inch CL (Hunt).

^c Ice cans are 30x9x48" rectangular steel tanks.

^d "Shorts" are sub-legal sized lobsters. They must be kept alive in circulating seawater and released at day's end (F.A.C. 46-24.003).

2.2.2. The 1960s and 1970s

The first comprehensive regulations were enacted in 1965. In terms of stock protection, some regulations were loosened; the closed season was shortened by nearly a week (i.e., the season was opened earlier) and the minimum size was reduced. In particular, lobsters having a 5.5-inch tail were now legal (previous regulations required a 6-inch tail). This may explain the 2.1 million pound (more than 50 percent) increase in landings that occurred in 1966.

Additional regulations designed to protect the stock were also enacted in 1965. First, female lobsters with eggs (i.e., "berried" lobsters) had to be released. Second, soak periods were allowed for traps; fishermen could pre-soak their traps up to ten days before the season opened. This allowed harvest to begin on opening day; however, traps had to be removed within five days after the close of the season to prevent desertion of old or worn traps. This is because deserted traps, known as "ghost traps," continue to cause lobster and bycatch mortality. These regulations are still in affect today.

In terms of the permitting process, permits were now numbered and eventually subject to a \$50 fee. This added restriction did not, however, negatively affect the fishery. In fact, total landings, vessel numbers, and traps all increased in the early 1970s (Figures 2-1 and 2-2).

Another permit was required if the head and tail were separated at-sea. This separation was necessary for vessels fishing far offshore that needed to ice the product. In 1969, the minimum tail length was increased to six inches if the head and tail were separated.

The most significant regulations enacted in 1965 concerned the marking, construction, and placement of gear. All harvest devices (e.g., traps), buoys, and vessels had to be (1) permanently marked with the owners permit number and (2) color-coded. Laws governing trap construction specified materials and size. Traps had to be made of wood slats and could be no larger than 3 x 2 x 2 feet (or twelve cubic feet). Wire mesh was allowed only on vertical surfaces. In terms of trap placement, no more than twenty traps could be placed on each line. Ice cans, drums, and similar devices were legal providing they were not equipped with anything resembling barbs, spears, or hooks.

At this time, sub-legal sized lobsters – referred to as "shorts" – were commonly used as attractants in the traps. In 1977, the use of shorts for attracting larger lobsters was limited to 200 per day. Additional regulations on shorts controlled on-board handling and use to reduce mortality; for example, the shorts must be keep in re-circulated seawater.

2.2.3. The 1980s until 1992

Regulations during this time modified those enacted in 1965. In terms of stock protection, the closed season was extended eleven days in 1987 – to a total of 127 days – from July 25 to August 5. Tighter rules governing the handling of shorts were enacted; the maximum number of shorts per vessel was reduced and release instructions were specified (e.g., shorts must be released an hour before dusk). In terms of gear, a maximum number of traps per individual was established (2,000) and the use of large nets (e.g., trawling) was prohibited; however, hand-held nets were still allowed (Florida Administrative Code, Chapter 46-24).

The most important and significant regulations concerned participation. A three-year moratorium on new permit issues began in July 1988. In addition, classification of spiny lobster as a “restricted species” was proposed; despite several postponements, this rule went into effect in 1994. This designation requires a special endorsement, which requires proof of a minimum fishing income, in addition to a saltwater product license.⁴

The regulations enacted in 1987 and 1988 – including a cap on the number of traps per individual, prohibition of trawling, increased regulations on shorts, and moratorium on new permits – were restrictive and expected to reduce landings. Landings increased approximately 2 million pounds, however, during the 3-year period following implementation of these rules. Given the restrictive nature of the aforementioned regulations, the increase in landings resulted from the extended closed season –which enabled additional growth before harvest – or three successive years of high recruitment.

2.3. Non-management Events That Have Affected the Industry

Several non-management factors have been considered important to the development of the fishery (Labisky, Gregory, and Conti; Simmons; Hunt). These main factors are listed in Table 2-2.

At the turn of the century, the Florida spiny lobster fishery was concentrated in the Florida Keys where the product was primarily used for bait. The construction of the Overseas Railroad in 1912 connected the Florida Keys with the mainland. This infrastructure had two impacts: (1) it increased the population in the Keys and (2) it opened markets for consumer demand. Since product could now be quickly transported to the mainland, lobsters began to be shipped to northern areas and sold as a “luxury” product. By the late 1910s, landings reached approximately 350,000 pounds. These landings were either consumed locally (40 percent), shipped north (40 percent), or used for bait (20 percent) (Labisky, Conti, and Gregory).

⁴ Over 25 percent of annual income or \$5,000 (whichever is less) must be earned from the sale of saltwater products, some exemptions apply (Florida Statutes 370.06(2)).

Table 2-2. Chronology of Non-management Events

Time Period	Event
1910s	<ul style="list-style-type: none"> • Construction of the Overseas Railroad
1920s	<ul style="list-style-type: none"> • Introduction of gasoline-powered boats
1930s	<ul style="list-style-type: none"> • Great Depression • Hurricane destroyed the Overseas Railroad
1940s	<ul style="list-style-type: none"> • Deep-freeze techniques developed • Population increase due to World War II • Foreign imports allowed
1950s	<ul style="list-style-type: none"> • Navy retirees remained in the Keys • Recreational harvesters
1960s	<ul style="list-style-type: none"> • Technological advancements (e.g., fiberglass) • Cuban immigration
1970s	<ul style="list-style-type: none"> • Bahamas closed its shelf to foreign fishers
1980s	<ul style="list-style-type: none"> • Cuban immigration • El Niño in 1983
1990s	<ul style="list-style-type: none"> • Hurricane Andrew

Gasoline-powered boats were introduced in the 1920s. This addition to the fishery extended the geographical fishing area. It also increased product quality since lobsters could be carefully scooped up with nets (as opposed to being hooked or speared). During the 1920s harvests increased to nearly 1 million pounds. By the late 1920s and early 1930s, however, poor economic conditions resulted in slow growth of the industry (as the population in the Keys declined) and consumer demand for luxury products waned. To make matters worse, a hurricane destroyed the Overseas Railroad in 1935. Although the Overseas Highway was constructed three years later, the lost market did not quickly recover. By 1940, harvests had decreased to just 400,000 pounds.

Several important events occurred in the 1940s. First, the advent of deep-freeze processing techniques expanded the marketing area. Second, World War II resulted in the construction of a water pipeline along the Overseas Highway. The additional fresh water supply increased population in the Keys, primarily military personnel and their families, and the number of fishermen rose. This increase in fishery participation resulted in an extension of the fishing area. Due to the heterogeneity between harvest areas – due to differences in depth, currents, and distance from port – the variety of gear types increased. The third major event occurred late in the decade when imports of foreign product were allowed. This policy change increased domestic competition in the consumer market. During the 1940s, landings increased to over 3.8 million pounds.

During the 1950s, the number of traps increased only slightly, however, lobsters were now being harvested for personal use. This marked the beginning of the recreational sector of the fishery.

Like the 1940s, the 1960s were characterized by several important events. First, harvest efficiency was greatly improved through several technological advancements, especially regarding vessel construction (e.g., boat length increased) and the use of hydraulic systems. Collectively these changes allowed for longer trips in poorer weather and increased the average number of traps a vessel could work. Overall, during the 1960s, the number of vessels increased from 254 to 440 (73 percent). The second major factor in the 1960s was the influx of approximately 300,000 aliens into the United States (primarily South Florida) from Cuba. Many immigrants settled around South Florida and became lobster fishermen. In addition to the 73 percent increase in vessel numbers, the number of traps increased over 200 percent from 1960 to 1970 (52,000 to 165,000, Figure 2-2). Despite the relatively large increase in trap numbers, both the average number of traps per vessel (Figure 2-3) and average yield per trap (Figure 2-4) remained constant during this time.

In the late 1960s, the Bahamian government expanded its sovereign fishing zone and displaced many U.S.-based vessels. By 1975, the continental shelf area of the Bahamas was closed to foreign fishermen. This closure significantly reduced landings and effort which had reached historical highs (Figures 2-1 and 2-2). The effect of these landings was evident in Figure 2-5 which disaggregated landings by coast (Florida's East Coast contained the Bahamian landings). Despite the decline in total landings and vessel numbers in the mid-1970s, the average number of traps per vessel increased from 538 in 1975 to 890 in 1980 and over 1,000 in 1981 (Figure 2-3).

In the 1980s a new round of Cuban immigration occurred which resulted in a corresponding increase in fishing effort; the number of traps increased from approximately 600,000 to nearly 1 million between the 1980-81 and 1991-92 seasons. Total vessel numbers also increased after dropping slightly in the mid-1980s. Overall, total landings and average trap yields did not exhibit noticeable trends. Total landings dropped by approximately 1.5 million pounds in 1983, most likely, from an El Niño induced weather system that produced a small recruiting class. The 1997-98 season, which was also impacted by an El Niño induced weather system, had relatively high landings that may dispel this theory (J. Hunt, FDEP, personal communication).

The continued rapid growth in the fishery caused congestion and conflict on the water, excessive mortality of undersized lobsters, and lower average yields per trap. In response, the trap certificate program (TCP) was passed into law in the early 1990s (Florida Statutes 370.142). Under this program, trap numbers were restricted and reduced for the first time. The TCP is the focus of the following section (Section 3).

3. MANAGEMENT OF THE TRAP CERTIFICATE PROGRAM

3.1. Summary of Legislative Provisions

Aside from TCP provisions discussed briefly in the first chapter, the following six subsections contain a thorough description of the main components of the program. The complete legal description appears in Florida Statutes 370.142. The FDEP maintains all data pertaining to the TCP and is the source of all statistics presented.

3.1.1. Eligibility and Initial Certificate Allocation

The initial certificates were only allocated to individuals with a saltwater product license (SPL) and crawfish endorsement.⁵ The number of certificates received under each SPL was proportional to the highest, season-total, reported landings during the benchmark period (the 1988-89 to 1990-91 seasons). Official landings were obtained from the Marine Fisheries Information System (commonly referred to as the Trip Ticket System). This system requires wholesale seafood dealers to submit a report including the total pounds and fisher's SPL number for every trip from which product was purchased.

The exact number of certificates allocated to each individual was determined as follows. First, total landings were calculated by summing the highest reported single-year landings, up to a maximum of 30,000 pounds for each SPL, across all SPLs (Florida Statutes 370.142(2).1). This total landings figure was then divided by 700,000 (the total quantity of certificates to be allocated) to obtain the catch-trap coefficient.⁶ Lastly, the highest single-year reported landings figure for each licenseholder was divided by the catch-trap coefficient to obtain the exact number of certificates to be issued to each individual. Fractional numbers were rounded, for example, 56.5 would become 56 but 56.6 would become 57 (FDEP, Chapter 62R-18).

The sum of landings equaled approximately 7.65 million pounds and resulted in a catch-trap coefficient of 10.93 pounds per trap (Hunt). Given the 30,000-pound cap, the maximum number of certificates allotted per SPL was 2,743. However, no licenseholder was allotted fewer than 10 certificates (Florida Statutes 370.142(2).1). A total of 727,313 certificates were initially allocated.

⁵ SPLs are issued to individuals or vessels and to residents, nonresidents, or aliens. Aside from an annual fee (ranging from \$50 to \$600 U.S. dollars), there are no restrictions. Vessel SPLs had to name at least one individual to receive the associated certificates. The crawfish endorsement or "C" number (\$100 per year) is necessary for anyone wishing to use trap gear to harvest crawfish (Florida Statutes 370.14(2)).

⁶ The catch-trap coefficient is basically a measure of average yield per trap. It is not, however, calculated from the unrestricted data as presented in Figure 2-4. This coefficient is affected by restrictions on individual landings and the total number of traps to be allocated.

In addition to the initial allotment of certificates – which occurred prior to the 1992-93 season – up to 125,000 certificates could be used “to settle disputes or other problems arising from implementation of the trap certificate program during the 1992-1993 and 1993-1994 license years” (Florida Statutes 370.142(4)g). According to Hunt, disputes over the initial allocation were anticipated by the Legislature due to the possibility of “...incorrect or lack of reporting of landings by wholesale seafood dealers during the benchmark years, possible hardships that may have limited one’s landings during the benchmark years, and other issues (p. 165).” The FDEP received advice on implementation problems from the Trap Certificate Technical Advisory and Appeals Board. Although the primary duty of this Board was to settle disputes arising from the initial allocation of certificates, the Board also had the authority to provide ongoing information on the operation of the program (Florida Statutes 370.142(4)).

The Board consisted of ten members: one designee of the FDEP and nine certificate holders appointed by the designee for terms ranging from one to four years (subsequent appointments were for four-year terms; Florida Statutes 370.142(4)a1,b). According to the statute, one appointee had to be Hispanic and speak both Spanish and English. The members had to represent different geographical areas; at least half had to reside in the Florida Keys and at least one had to be from Broward, Dade, and Palm Beach counties. In addition, two members had to hold less than 100 certificates, two had to hold between 100 and 750, three had to hold between 750 and 2,000, and two had to hold more than 2,000 certificates each (Florida Statutes 370.142(4)(a)1.a,b,c).

Disputes were handled through appeals to the nine certificate-holding members of the Appeals Board. The FDEP designee to the Board, the secretary, gave final approval to each decision made by the participant-members. Certificates not allocated by March 31, 1994 were considered permanently unavailable. After July 1, 1994, the Board lost authority to participate in issues relating to the implementation of the program, including grievances over the initial allocation of certificates (Florida Statutes 370.142(4)2). The Board was dissolved in September 1994 after the program was fully established and the appeals period ended (Florida Statutes 370.142(4)i). During the two-year appeals process the Board allocated 100,947 certificates.

3.1.2. Restrictions on the Number of Certificates Owned

No one person, firm, corporation, or other business entity may control, directly or indirectly, more than 1.5 percent of the total number of certificates available in any license year (Florida Statute 370.142(2)a.2). This restriction places a lower bound on the total number of certificate owners in the fishery; no fewer than 67 participants are allowed. Given that approximately 3,700 individuals received certificates in the initial allocation, this restriction allows for a relatively high degree of concentration under the program. Note that there are no restrictions on ownership within families.

The ownership restriction also places an upper bound on the number of certificates that can be held by any one individual. This maximum number of certificates will vary, however, based on the total number of certificates available. For example, if there are 750,000 certificates, the maximum number of certificates an individual can own is 11,250. If the total number of certificates were to decrease to 250,000, an individual would not be allowed to own more than 3,750 certificates.

3.1.3. Ownership Transferability

Certificates were transferable between SPL holders beginning April 1, 1993 for a "fair market value" agreed upon between the transferor and transferee (Florida Statutes 370.142(2a.1)).⁷ Transfers, which are still allowed, must be submitted between August 1 and March 1 on a notarized form provided by the FDEP (DEP 20-173-FMP). The sales price must at least equal (or be greater than) the annual certificate fee. Barter, trades, or gifts of trap certificates are illegal. Following a transfer, the notarized form and associated fees (Section 3.1.4) must be submitted to the FDEP within 72 hours.

It is important to note that the TCP legislation only regulates the ownership and transfer of certificates. Rules governing the ownership and transfer of traps, which concern notifying the Division of Law Enforcement with the number of traps and license (or trap) numbers involved, are provided in the Florida Administrative Code (F.A.C. Chapter 46-24.006(5)). Leasing of certificates, which is not explicitly addressed in the Florida Statute that established the TCP (F.S. 370.142), is discussed in Section 3.1.5.

3.1.4. Fees and Surcharges

Two types of fees are charged through the TCP: (1) annual certificate fees, and (2) fees related to the transfer of certificate ownership. These fees are in addition to licensing and permitting costs.

Each trap utilized for harvesting spiny lobster for commercial use – in state or adjacent federal waters – must have an affixed tag issued by the FDEP. Each certificate entitles its owner to one tag and, therefore, the use of one trap. An annual certificate fee is collected to recover administrative costs associated with the program. Until 1995, the fee for each certificate was \$0.50. For 1995 through 1997, the annual fee was \$0.75. In 1998 (the 1998-99 season), the annual fee increased to \$1.00 per certificate (Florida Statutes 370.142(2b)). If the annual fee is paid, the certificate is considered "active" – assuming all other licensing and endorsement fees have been paid – and the owner is issued a tag, which is to be permanently attached to the trap during the season.⁸

⁷ The FDEP interpreted "fair market value" to be the actual price paid for each certificate (Chapter 62R-18, effective 2-11-96).

⁸ To receive the tag, all past annual fees must have been paid. For example, if the certificate was inactive (not paid) in the prior year, the certificate owner would have to pay the annual fee from the prior year in addition to the current year fee.

Otherwise, the certificate is “inactive” and the tag remains at the FDEP. All certificates for which the annual fee is not paid for three years are considered “abandoned” and ownership reverts to the FDEP. Abandoned certificates become permanently unavailable during years in which the total number of certificates is being reduced (see Section 3.1.6), otherwise the certificates are reallocated (Florida Statutes 370.142(2)c.6).

“In addition, in order to cover the added administrative costs of the program and to recover an equitable natural resource rent for the people of the state, a transfer fee of \$2 per certificate transferred shall be assessed against the purchasing licenseholder” (Florida Statutes 370.142(2)a.1). A one-time surcharge of 25 percent of the “fair market value given to the transferor” also applies to the first time a certificate is sold outside the original transferor’s immediate family (Florida Statute 370.142(2)a.1).⁹ “Immediate family members” include a parent, spouse, or child according to the FDEP Certificate Transfer Form (DEP 20-173-FMP); however, Chapter 62R-18 authored by the FDEP, also includes siblings, step children, and step parents.

The statutes also allow the FDEP to recover “an equitable rent per trap” as “partial compensation to the state for the enhanced access to its natural resources” (Florida Statutes 370.142(2)a.1). The department is required to consider annual program revenues, the fair market value of certificates, and the economic viability of commercial spiny lobster fishing in making its decision. A fee based on equitable rent has not been implemented to date.

3.1.5. Prohibitions and Penalties

It is unlawful for anyone to (1) possess equipment for taking spiny lobster that is not allowed by law (e.g., traps of the wrong dimension or material), (2) possess a trap without an affixed official tag, or (3) possess or use tags without the appropriate number of valid certificates (Florida Statutes 370.142(2)c). First violations are assessed a civil penalty of no less than \$500 and possible suspension of the crawfish trap number for the remainder of the license year. Repeated violations can result in a \$5,000 civil penalty and two-year suspension of both the crawfish trap number and SPL. Loss of the SPL would affect participation in other commercial fisheries.

It is also unlawful for any person to “barter, trade, sell, supply, agree to supply, aid in supplying or give away a spiny lobster trap tag or certificate” (or conspire to do such things), “unless such action is duly authorized by the department as provided in this chapter or in the rules of the department” (Florida Statutes 370.142(2)c.4.c). A violation of sub-subparagraph 4.c, can result in a fine of up to twice the amount of the surcharge on the fair market value of the transferred certificates (Florida Statutes 370.142(2)c.5.b).

⁹ The 1998 Supplement to Florida Statutes 1997 established a minimum surcharge of \$5 per certificate and replaces “fair” with “actual” – which is similar to the current interpretation by the FDEP (Chapter 62R-18) – in reference to the market value of a certificate.

Note that the FDEP defined the terms and procedures for implementing the TCP, including the leasing of certificates, in Chapter 62R-18. A subsection of this chapter titled "Rental or Leasing of Trap Tags" authorized use of tags by someone other than the owner for a period not to exceed the fishing season (Chapter 62R-18.006). In addition, the owner of the certificate can lease in each season provided he/she notifies the FDEP in writing. According to a recent analysis by the FDEP,¹⁰ however, the Office of General Council "concluded that lobster trap tag certificates should not be leased or otherwise used by anyone other than the trap certificate holder." This FDEP analysis supported Senate Bill 1506 to eliminate leasing activity beginning with the 2003-4 season; this legislation appears in the 1998 Supplement to Florida Statutes 1997 (s. 370.142(2)(a)5).

3.1.6. Trap Reductions

The stated objective of the TCP was to reduce the number of traps used in the fishery. To achieve that objective, the Marine Fisheries Commission can reduce the number of legal traps by up to 10 percent from the total issued in the previous season. Such a reduction would be applicable to all certificate holders; that is, each individuals holdings would be reduced by the percentage specified (Florida Statutes 370.142(3)).

Reductions are first taken from abandoned certificates (i.e., certificates whose annual fee is unpaid for three years). Under this policy, it is possible that holders of active (paid) and inactive (unpaid in the current year) certificates will be unaffected by a reduction. If, however, the total quantity to be reduced exceeds the number of abandoned certificates, each certificate holder will have their allotment reduced by the chosen percentage. In such a situation, certificates are reduced based on type for each individual (FDEP 1994, p. 22).¹¹ This priority reduction scheme is designed to maximize surcharge receipts. In particular, if an individual holds multiple types of certificates, then the reductions will first be applied to certificates that have already been transferred out of the family (i.e., have already been subject to the one-time surcharge fee) (Section 3.1.4).

Since the inception of the program, four 10 percent reductions have been mandated. These reductions have reduced the total number of certificates by approximately 277,000 from original allotments that totaled more than 828,000 (from initial allocations and subsequent appeals) (FDEP, personal communication). In addition, another 10 percent reduction is planned for 2000 (Florida Administrative Code, Rule 46-24.009). Following this reduction, the total number of certificates available in 2001-02 will be approximately 489,650, or 41 percent of the original issues and 48 percent of the total number available in 1991-92 – according to Muller et al. – before the TCP was enacted.

¹⁰ Section II.A. in Bill Analysis Form SB 1506 authored by B.M Deterding, A.M. Cordero, and F. Wettstein (3/3/98) and Bill Analysis Form HB 3813 authored by B.M Deterding and H.M. Watson (3/5/98).

¹¹ There are three types of certificates. All certificates are Type A-1 at initial issue. Certificates transferred to family members are Type A-2 and those transferred to non-family members are Type B.

3.2. Projected Administrative Costs and Revenues

Projected costs and revenues were obtained from unpublished documents provided by the FDEP, including notes by Dr. Orbach – Department of Sociology and Anthropology at East Carolina University – and a memorandum from the Department of Natural Resources (now the FDEP) to the Senate Appropriations Committee. Both documents were written in early 1991. The total cost and revenues projected in the first year of the TCP are summarized in turn and followed by projections of net revenues for the first three years.¹² Note that these projections were derived to analyze the feasibility of the program and, therefore, were generated prior to its implementation. These projections are compared to actual costs and revenues – as reported by the FDEP following program implementation – in Section 5.

3.2.1. TCP Costs Projected for the First Year

The DNR, now known as the FDEP, predicted a first-year total expense of \$313,722. The majority of this total cost, 59 percent, was to fund additional personnel and 32 percent would pay for production and distribution of the tags. Just over \$29,000, or 9 percent, represented one-time costs associated with hiring personnel and software programming. The complete breakdown of these costs is presented in Table 3-1.

Table 3-1. TCP Costs Projected by the DNR (1991) for the First Fiscal Year

Expense	Computation/Comments	Amount
Program Implementation	Appropriation to MFC	\$ 20,000
Software Programming	Total cost	5,000
Administration:		
Salaries (2 FTE positions)	Financial Assistant and Senior Clerk	41,696
Standard Expenses	\$5,327 per position	10,654
Other Capital Outlays	\$3,095 per position	6,190
Law Enforcement:		
Salaries (5 FTE positions)	Professional and 4 support staff	90,230
Standard Expenses	Total cost for all positions	22,056
Other Capital Outlays	Total cost for all positions	17,896
Tags and Tag Distribution	Production and mailing costs	100,000
TOTAL		\$ 313,722

Continuing expenses were divided into three categories: administration, law enforcement, and tags. In the first year, law enforcement would be the largest expense at \$130,000. The cost to have the tags made and distributed would equal \$100,000. Administration during the first year would add another \$58,500 to total program costs.

¹² State and federal tax revenues were also projected; however, since these funds would not be collected by the FDEP, they were not included in this analysis.

3.2.2. TCP Revenues Projected for the First Year

Assuming an initial allocation of 750,000 certificates, the DNR projected that up to \$375,000 could be collected in the first year from the annual certificate fee. An additional \$75,000 would be collected if 5 percent of the total number of certificates were sold. By further assuming a \$25 sales price, the DNR estimated an additional \$234,375 would be collected if all transfers were between non-family members and, thus, subject to the surcharge. Table 3-2 contains a summary of these TCP revenues, projected at over \$680,000 in year 1.

Table 3-2. TCP Revenues Projected by DNR (1991) for the First Fiscal Year

Activity	Variables in Revenue Computation			Revenue (C x R x F) ^a
	Certificates (C)	Transfer Rate (R)	Fee (F=\$/C)	
Certificate Fee	750,000	N/A	\$ 0.50	\$ 375,000
Transfer Fee	750,000	5%	\$ 2.00	\$ 75,000
Transfer Surcharge	750,000	5%	\$25.00	\$ 234,375
TOTAL				\$ 684,375

^a The Transfer Surcharge is calculated by C x R x F x 0.25.

The majority of the first year's revenue, nearly 55 percent, would result from the certificate fee. Transfer revenues would account for the remaining 45 percent, that is, 11 percent from the \$2 per certificate transfer fee and 34 percent from surcharge receipts (which equal 25 percent of the total value of the transaction). Total surcharge revenues are a function of the assumed transfer rate (5 percent) and the assumed certificate transfer price (\$25). The DNR specified the transfer price as the product of the observed price of lobster (approximately \$3.50 per pound) and estimated annual yield per trap (7 pounds), that is, the gross revenue expected from the use of one trap for one year.¹³ This approach, however, neglected the fixed and variable costs associated with trap use and the (potential) infinite ownership of the certificate (Quigley).

These revenues would be dispersed among three accounts. The Marine Biological Research Fund would receive 25 percent of transfer revenues and 30 percent of annual fees for research and monitoring of the program. The Marine Fisheries Commission Fund would receive 15 percent of transfer revenues for the development of the program. The Motorboat Revolving Trust Fund would receive 60 percent of transfer revenues and 70 percent of annual fees for administration, education, and program enforcement including surveillance and trap retrieval.

¹³ To emphasize the importance of the assumed values, Orbach estimated transfer revenues (fees and surcharges) of \$641,250, over double the DNR estimate using an equal number of certificates. The discrepancy is the result of two factors: (1) a higher transfer rate (10% versus 5%) and (2) a higher transfer price (\$30 versus \$25 per certificate).

3.2.3. TCP Net Revenue Projections for the Initial Three Years of the Program

Costs for the second and third seasons were estimated by modifying the projected cost in the first year (Table 3-1) as follows: (1) program implementation, software programming, and other capital expenses were deleted, (2) administrative salaries were assumed to increase three percent annually, and (3) law enforcement salaries were assumed to increase five percent annually. Revenues, on the other hand, would decline 10 percent in each year, assuming 10 percent reductions in the total number of certificates would be mandated by the MFC in the second and third seasons. It was further assumed that the number of certificates transferred would also decrease 10 percent.

The projected costs and revenues for the first three years of the TCP are compared in Table 3-3. Overall, the program was projected to generate positive net revenues for each of the first three seasons. Net revenues were predicted, however, to fall from nearly \$371,000 in the first year to approximately \$278,000 in the third; the 25 percent reduction would be due to the reduced number of certificates and foregone annual tag fees. Under the assumed conditions, the program would be self-financing.

Table 3-3. TCP Net Revenue Projections for the First Three Years of the Program

	Year 1 (750,000 certificates)	Year 2 (675,000 certificates)	Year 3 (607,500 certificates)
Revenue	\$ 684,375	\$ 615,938	\$ 554,344
Cost	\$ 313,722	\$ 270,339	\$ 276,424
NET REVENUE	\$ 370,653	\$ 345,599	\$ 277,920

The first step in evaluating the feasibility of the program is to determine the number of certificates that were available in each year, that is, the number of certificates that were subject to the annual certificate fee. The following section (Section 3.3) summarizes this information. The information on certificate transfers and sales prices needed to calculate the total revenue from transfers is reserved for Section 4.

3.3. Changes in the Number of Certificates under the TCP

The number of certificates available since the TCP began has been affected by appeals regarding the initial allocation and reductions mandated by the MFC. The timing of these activities, and the subsequent certificate balance, is summarized in Table 3-4. According to Hunt et al. (1994, 1998) and Hunt, between 939,000 and 986,000 trap tags, respectively, were issued in the year before the TCP.¹⁴ Under the TCP, only 724,232

¹⁴ The number of tags issued does not necessarily equal the number of traps in the fishery since an unlimited number of tags were available and some individuals believed (incorrectly) that this number would be used to determine the number of certificates they would receive under the program (A. Cordero, FDEP, personal communication).

certificates were distributed during the initial allocation of permits. By the 1998-99 season, only 544,062 certificates were available. The program has reduced the number of traps in the fishery by 42 to 45 percent from pre-program estimates by Hunt et al. (1994, 1998) and Hunt, respectively. The total number of certificates available does not, however, indicate the number of active certificates, which could be less due to non-payment of applicable annual fees. The number of active certificates is, however, the appropriate number to estimate annual certificate revenues and the legal number of traps in the industry. Appendix A contains the number of certificates by account status, including the number active.

Table 3-4. TCP Activity Log from 1991-92 through 1998-99

Season	Number of Participants ^b	Change in Number of Certificates by Activity ^a			Certificate Balance ^b
		Reductions	Appeals	Lottery ^c	
1992-93	3,696	-	-	-	724,232
1993-94	3,594	<72,996>	98,254	-	746,778
1994-95	3,521	<75,326>	2,693	-	674,089
1995-96	3,402	<67,892>	-	-	606,679
1996-97	2,399	-	-	7,231	605,973
1997-98	2,159	-	-	-	604,920
1998-99	2,158	<60,850>	-	-	544,062
TOTAL		<277,064>	100,947	7,231	

^a Source: A. Cordero, 1993-97 seasons (FDEP, personal communication). The 1998-99 reduction was determined from the total number of certificates available.

^b Source: J. O'Hop (FDEP, personal communication). Participants are counted by their full name.

^c The FDEP devised the lottery process (62R-18.009) to reallocate abandoned certificates.

Since the initial allocation of certificates in the 1992-93 season, the program has reduced effort by 25 percent. Mandated reductions have totaled more than 277,000 certificates, but these reductions were partially offset by the new issue of approximately 101,000 certificates. In particular, the Appeals Board began with 125,000 certificates, issued 100,947 to 347 individuals, and lost 10,918 in the reductions. The remaining balance became permanently unavailable. Before the 1996-97 season, 7,231 abandoned certificates were reallocated among 463 current certificate holders by lottery. Each 'winner' received from 10 to 70 certificates.¹⁵ In early program summaries, these certificates increased the total balance. In a recent summary, however, the certificates were correctly labeled as transfers since they represent the reallocation of abandoned certificates (not an issue of new certificates) as required by statute 370.142(2)(c)6.

¹⁵ Each current certificate holder could submit 830 entries, one for every lot awarded. Each lot contained 10 certificates. Initially 8,300 certificates were to be awarded, however, the number was reduced when owners of 1,069 certificates chose to pay past fees. Winners were chosen randomly by computer (A. Cordero, FDEP, personal communication).

The number of individuals with certificates – identified by the owner’s full name (i.e., last, first, middle initial, and title) – decreased 42 percent between the 1992-93 and 1998-99 seasons.¹⁶ The largest reduction occurred following the 1995-96 season. The exit of fishermen could be due to trap reductions that rendered the operation too small to produce adequate revenue. Even though individuals can purchase additional certificates to return to their former operating level, the acquisition would not be costless. Costs incurred by the purchaser would include, for example, the transactions cost associated with finding someone willing to sell, the cost of the certificates paid to the previous owner, and the fees owed to the FDEP (i.e., transfer fee and surcharge, if applicable).

¹⁶ Several alternative statistics can be used to track participation including the number of SPLs, crawfish endorsements, or the number of trap certificate accounts. These statistics are compared in Appendix B.

4. EVALUATION OF CERTIFICATE TRANSFERS

Several criteria are used to measure and evaluate the market for trap certificates, including changes in the total number of certificates, concentration ratios, the number of participants, entry and exit behavior, certificate transfers (i.e., number, volume, and price), and geographic distribution.

4.1. Types of Certificates

Although each certificate allows the use of a single trap, certificates are categorized by the FDEP to identify different types of ownership (Chapter 62R-18.002). There are three types of certificates:

- (1) **Type A-1:** Certificates received from the initial allocation, an appeal, or through lotteries of abandoned certificates. Type A-1 certificates have never been transferred.
- (2) **Type A-2:** Certificates sold to members of the immediate family (i.e., parent, step-parent, child, step-child, sibling, or spouse) following the initial allocation.
- (3) **Type B:** Type A-1 or A-2 certificates sold to individuals outside the immediate family.

A distinction is made between sales to individuals outside the immediate family and sales to family members since the latter transactions are not subject to the 25 percent surcharge fee and they are the last type of certificate affected by a reduction in the number of certificates. Specifically, if the number of traps to be reduced exceeds the number of inactive – unpaid – certificates (which are reduced first), the first reductions apply to an individual's Type B certificates, then Type A-2, and last to Type A-1 certificates that have never been transferred (FDEP 1994, p. 22; Chapter 62R-18.007). As stated earlier, if the number of traps to be reduced is less than or equal to the number of inactive certificates, the number of active traps in the fishery will not change.

4.2. Annual Certificate Balance

The total number of certificates – and, therefore, the maximum number of legal traps in the commercial sector – have decreased since the initial allocation due to the mandated reductions. Since the initial allocation of certificates, the total number of certificates available has fallen 25 percent (Table 3-4). Despite the overall reduction, the total number of certificates increased in 1994 due to appeals awards. Using the peak holdings in 1994, the total number of certificates has fallen 27 percent. The annual number of certificates available by type under the TCP is summarized in Table 4-1.

Overall, the number of Type A-1 certificates has continually decreased while the numbers of Type A-2 and Type B certificates have increased.

Table 4-1. Number of Certificates by Type, 1993-99

Year ^a	Type of Certificate			Total
	A-1	A-2	B	
1993	689,094	2,910	32,228	724,232
1994	632,486	7,498	106,794	746,778
1995	537,452	6,733	129,904	674,089
1996	450,491	9,375	146,813	606,679
1997	411,446	13,982	180,545	605,973
1998	390,777	14,951	199,192	604,920
1999	363,675	13,984	166,403	544,062

^a Year in which the season ended, for example, 1993 reflects the 1992-93 fishing season.

Upon initial allocation, all certificates (724,232) were of Type A-1. During the first year under the program, the percentage of Type A-1 certificates fell to 95 percent due to transfer activity. By the 1998-99 season, only 67 percent of the total number of certificates were of Type A-1. During that same time, the proportion of A-2 and B certificates increased from 0 percent to 2.5 percent and 30.6 percent, respectively.

The certificate balances in each year (Table 4-1) may not, however, represent the number of traps actually used since individuals may have chosen not to pay the annual certificate fee. If the annual fee was not paid, the corresponding tag(s) remain with the FDEP and the traps cannot legally be used. The percentage of active certificates – those whose annual fee has been paid – increased from 94 percent in 1994 to nearly 99 percent in 1998; fewer individuals chose to leave their traps idle.¹⁷ Appendix A contains the annual certificate balance by account status and certificate type.

4.3. Concentration of Certificate Holdings

Differences in production costs are expected to change the concentration of certificate holdings under the TCP. Differences in production cost can result from differences in the captain's skill, vessel characteristics and operation, and/or efficiency of the crew members. Theoretically, firms (i.e., certificate owners) with relatively low production costs are the most profitable. These low-cost firms will find it in their interest to expand production. To expand, an individual must purchase (or lease) additional trap certificates. It is beneficial for a certificate holder to sell when the price offered is greater than their expected discounted stream of rents from the continued use of the certificate. Consequently, the least efficient firms will find it rational to leave the industry (although

¹⁷ Statistics for 1993 and 1999 do not represent end-of-year or "close-out" balances and, therefore, cannot be used to examine the true number of active certificates.

some may exit for non-economic reasons such as poor health). Conversely, those with the most efficient operations would be expected to increase certificate holdings.

There are many ways to measure the concentration of a market. One commonly used measure is the Concentration Ratio:

$$CR_X = \sum_{j=1}^X MS_j$$

MS_j is the market share of the j th firm and X is the number of firms to be included (Carlton and Perloff). This measure will range from zero to 100 percent where higher values represent increasingly concentrated markets. The concentration ratio is typically calculated for only the four largest firms. For example, the CR_4 's for meat products, breakfast cereals, and cigarettes are 32, 87, and 92 percent, respectively (Carlton and Perloff, Table 9.5).

In this report, the "market" refers to the total number of certificates available and "firms" are the individual certificate holders.¹⁸ Given that approximately 2,200 individuals owned certificates in the 1998-99 season (i.e., $CR_{2200}=100$), the relevant concentration ratios for this market are calculated using a larger number of firms than is customary. The 50, 100, and 500-firm concentration ratios for this fishery are shown in Table 4-2. For example, CR_{50} is the percentage of the total balance held by the 50 individuals with the most certificates (i.e., $X=50$). The concentration values were based on the total number of available certificates reported in Table 4-1.¹⁹ For comparison, note that – given ownership restrictions – the maximum CR_{50} is 75 percent and CR_{67} would equal 100 percent.

Table 4-2. The CR_{50} , CR_{100} , and CR_{500} for the Spiny Lobster Fishery, 1993-99

Year	Concentration Ratios for the Participants Holding the Most Certificates ^a		
	CR_{50} (%)	CR_{100} (%)	CR_{500} (%)
1993	19.2	34.6	87.8
1994	17.4	32.2	88.8
1995	18.2	33.5	91.1
1996	19.7	35.4	92.8
1997	21.7	37.5	94.7
1998	22.0	37.9	95.7
1999	22.1	37.9	95.7

^a The largest 50, 100, and 500 firms represent on average 1.7, 3, and 14.5 percent, respectively, of the total number of individuals in years 1993-96. These percentages increased to 2, 4.5, and 23 in years 1997-99.

¹⁸ Trap certificate account numbers are used as a proxy for individuals. Since an individual can have multiple account numbers, the figures in this section may underestimate concentration levels; however, given that there are very few multiple account owners (0.2 percent), this bias is assumed small.

¹⁹ The balance data set does not contain leasing information. Given the temporary nature of such agreements (which prevents long-term market control), and that voluntarily reported activity to the FDEP has involved relatively few certificates, leasing was not expected to appreciably affect the measures.

Overall, the *CR* ratios indicate an increasing, although small, degree of concentration. For example, the 100 individuals who own the most certificates collectively accounted for 38 percent of the total during the 1998-99 season. In the commercial spiny lobster fishery, however, 100 individuals represent less than five percent of the total number of certificate holders.

The concentration ratios for the 50 and 100 largest firms decreased from 1993 to 1994. This reduced concentration could have resulted from the increase in total certificate numbers during 1994 due to appeals. If so, the appeals were not awarded to the largest 100 firms. Although the concentration ratios of the largest 50 and 100 firms increased slightly from 1993 to 1999, it is unclear whether the recent increase represents a continuing trend. In contrast, the concentration of certificate ownership by the largest 500 firms continually increased from 1993 to 1999 (a total of 8 percentage points).

Figure 4-1 presents the relationship between the number of individuals owning certificates, sorted in descending order by the number of certificates held, and the market share (i.e., the percentage of total certificates) for the 1998-99 season.

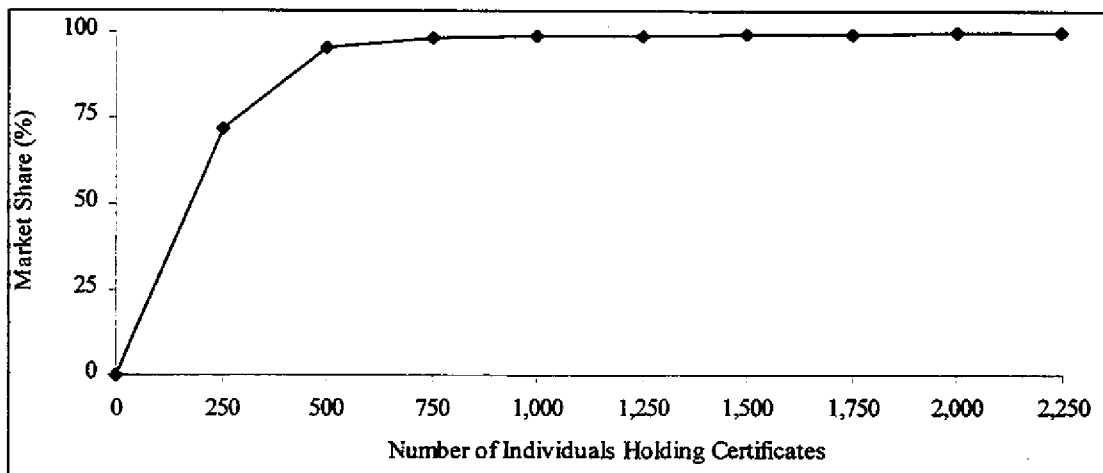


Figure 4-1. Concentration Ratios at Increasing Numbers of Participants Ordered by the Number of Certificates Owned during the 1998-99 Season

According to Figure 4-1, the 250 individuals with the most certificates held nearly 72 percent of the total number of certificates available in 1998 for the 1998-99 season. In general, concentration increases rapidly through the 500 individuals with the largest certificate holdings. The *CR* levels off after the market share of these 500 individuals has been accounted for. Overall, these 500 individuals – representing 23 percent of all certificate holders – held nearly 96 percent of the certificates available for the 1998-99 season.

Another way to look at the concentration of certificate ownership is to examine the number of people that own more or less than 100 certificates. From 1993 to 1999, the number of individuals holding more than 100 certificates declined steadily from 729 (20 percent) to 541 (25 percent). In addition, during the 1998-99 season, only 300 (14 percent) held between 7 and 100 certificates. The majority of individuals (61 percent or 1,310) held only the minimum number of certificates (i.e., six).²⁰ According to John Hunt (FMRI, personal communication), individuals initially issued 10 certificates (the minimum) did not have a landings history and, therefore, may not be appropriately considered commercial harvesters. Given that these individuals are technically members of the commercial sector and are allowed to increase certificate holdings, they are retained in this analysis. It is notable, however, that if these individuals are excluded, the concentration ratios would increase, but the increase over time (i.e., the degree of concentration under the TCP) would fall.²¹ This latter result suggests the concentration of certificate holdings may not be as large as predicted by the interyear increases in Table 4-2. Note that these measures reflect minimum concentration levels. Implicit cooperation, such as through membership in a fish house or actual trap use through leasing, would result in higher effective concentration levels.

4.4. Number of Participants

A total of 3,896 individuals have been involved in the TCP by owning certificates since its inception (Appendix B).²² The total number of individuals holding certificates and the average number of certificates owned in each year is presented in Figure 4-2. The total number of certificate holders fell from 3,696 in 1993 to 2,158 in 1999, a decrease of 42 percent. Conversely, the size of the average operation increased during the TCP. From 1993 to 1999, the average number of certificates held increased from approximately 196 to 252 (28 percent). Note also that the maximum number of certificates held by any one individual increased from 3,674 to 5,631 (53 percent) during the period. A slight increase in 1994 (from 196 to 207 certificates per person) reflected the net effect of people leaving the industry (i.e., selling their certificates) and additional certificates being allocated from appeals. Average holdings increased significantly in 1997 as the number of participants fell. Average holdings fell in 1999 from the reduction, however, the net effect of entry and exit resulted in only one participant leaving the industry.

²⁰ Six certificates would be the minimum if owners have not sold any certificates since the initial allocation. (of course, an individual could have sold all but 6 certificates). The 2,165 total individuals represent the number of unique "C" numbers, including 10 unreported numbers.

²¹ When individuals holding the minimum number of certificates were excluded, the CR_{100} equaled 36.1 percent in 1993 and increased 2.4 percentage points to 38.5 in 1999. The CR_{500} increased only 5.7 percentage points, from 91.4 to 97.1 percent, from 1993 to 1999.

²² The number of individuals is calculated using the owners full name. This is necessary since individuals can have multiple account and endorsement numbers.

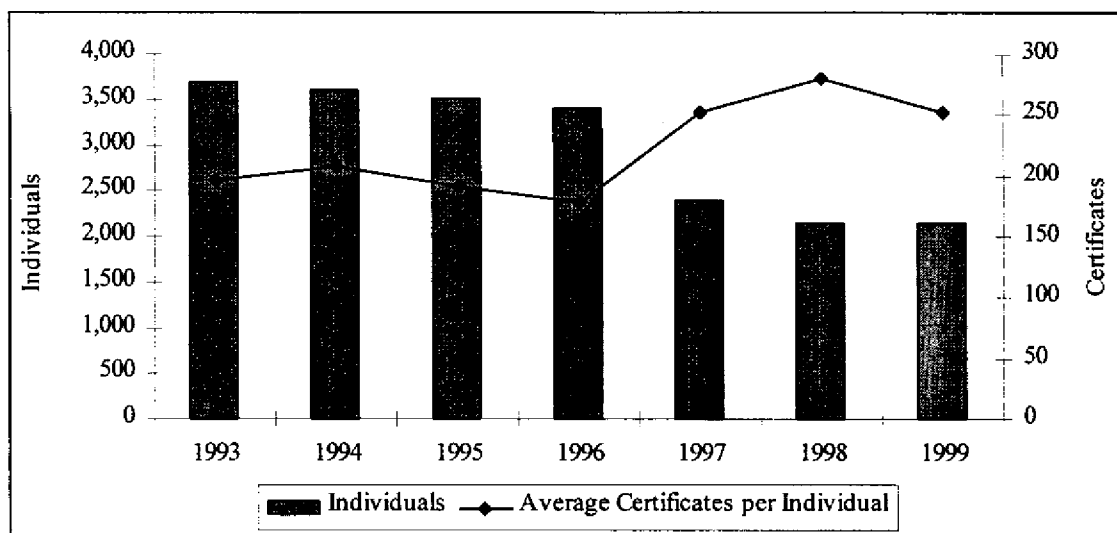


Figure 4-2. Number of TCP Participants and Average Certificate Holdings, 1993-99

4.5. Entry and Exit Behavior

To examine the effect of the TCP on the number of industry participants, it is necessary to determine entry and exit behavior during the course of the program. A total of 1,693 accounts with certificates in 1993 were either excluded or had a zero balance in 1999 (i.e., there was a 54 percent decrease in the number of original participants; Figure 4-2). Note that using account numbers as a proxy for the number of participants is valid for approximation purposes given the small incidence of participants with multiple accounts (footnote 18, and appendix B).

In terms of participation throughout the program, approximately 2,000 accounts with certificates in 1993 continued to have certificates in 1999. In addition, 149 new accounts were issued since 1993; that is, up to 149 individuals who did not own trap certificates in 1993 purchased certificates between 1994 and 1998 to have a positive certificate balance for the 1998-99 season.

Using FDEP annual data on the official number of trap certificates owned by each account, entry and exit behavior is examined in Table 4-3. In particular, the table contains the number of accounts (i.e., individuals) that entered and exited the fishery *between* years. For example, 152 individuals exited the fishery in 1993; that is, 152 people with certificates in 1993 sold all of their certificates prior to the start of the 1994 season (i.e., could not legally use traps in 1994). The most people – 1,106 or approximately 32 percent – exited the fishery before the start of the 1996-97 season. In terms of entrants, the number of people entering the fishery increased by a relatively large amount (101 in total) before the start of the 1997-98 season.

Table 4-3. Between Year Entry and Exit, 1993-99

Year	Number of Fishers ^a		Net Change
	Exited	Entered	
1993	152	NA	NA
1994	89	49	- 40
1995	146	16	- 130
1996	1,106	27	- 1,079
1997	264	101	- 163
1998	4	25	+ 21
1999	NA	3	NA

^a An "NA" indicates that the number is not available.

4.6. Certificate Transfers

4.6.1. Number of Transactions

Certificates are transferable among licensed fishermen for a "fair market value" (Florida Statutes 370.142(2.a.1)). The seller must have all past and current certificate and license fees paid. The buyer must have a current SPL with Restricted Species and Crawfish/Lobster endorsements. Each transaction must be reported to the FDEP within 72 hours. Along with the appropriate fees, the following additional information must be included: the transaction date, number of certificates traded, exchange price(s), and the names, account numbers, and notarized signatures of the buyer and seller. Certificate transfers are only accepted by the FDEP between August 1 and March 1 (FDEP Form DEP 20-173-FMP; Chapter 62R-18.002(19)). This limited transfer period allows the FDEP to calculate year-end balances, reduce certificates if mandated, and prepare invoices for the annual fee (to be paid prior to the start of the following season).

In all, 1,175 transactions occurred from 1994 through 1998 (the only years for which data are available). The majority of transactions involved Type A-1 certificates, which is to be expected given the higher number of total certificates of that type. The annual number of transactions by certificate type is shown in Table 4-4. The total number of transactions was highest during the 1997-98 season, followed by the initial trading season (i.e., 1993-94). The number of transactions fell in 1995, perhaps due to the additional allocations from appeals. From 1995 to 1997, the total number of transfers increased from 166 to 375 (126 percent). The number of transactions also fell in the 1997-98 season, most likely due to the scheduled reduction in 1998.

Table 4-4. Number of Transactions Involving each Type of Certificate, 1994-98

Year	Type A-1	Type A-2	Type B	Total ^a
1994	247	0	13	257
1995	147	3	27	166
1996	188	3	17	199
1997	339	4	62	375
1998	147	5	43	178
TOTAL	1,068	15	162	1,175

^a Totals may be less than the sum by certificate type since trades can involve multiple certificate types.

The trend in transactions involving Type A-1 certificates is identical to the trend in total transactions. The number of transactions involving Type A-2 certificates is relatively small, accounting for less than one percent of the total. The number of transactions involving Type B certificates is also relatively small compared to the total, ranging from 5 percent in 1994 to 24 percent in 1998.

4.6.2. Volume of Certificates Traded

Trading began on April 1, 1993 and 34,446 certificates were transferred (nearly 5 percent of the total) between April 1 and June 30, 1993 during a special "preseason transfer period."²³ During the first full trading season (August 1, 1993 to March 31, 1994), however, over 12 percent of all certificates changed hands. During the following years, the proportion of certificates traded has remained stable between 8 and 10 percent but fell to just 6 percent in 1998. In each year, the majority of certificates transferred were of Type A-1. Table 4-5 contains the numbers of certificates traded by type in each year.

Table 4-5. Total Number of Certificates Transferred by Type, 1994-98

Year	Type A-1	Type A-2	Type B	Total
1993	NA	NA	NA	34,446 ^a
1994	85,111	0	5,777	90,888
1995	42,466	765	11,151	54,382
1996	44,587	417	7,398	52,402
1997	38,332	311	20,405	59,048
1998	19,123	801	15,118	35,042

^a The total was calculated using the total reported transfer revenue. The number by type is not available (NA) for 1993; however, given 1993 was the first year of transfers, the majority had to be Type A-1.

²³ This transfer period was identified from the FDEP Form DEP 20-173-FMP; however, Chapter 62R-18R.002(19) states the initial period occurred from January 1 through March 31, 1993. The exact timing of this period is unimportant for this analysis.

Overall, at least 326,208 certificates were transferred between the 1993 and 1998 seasons. Type A-1 certificates transferred, as a percentage of the total, fell from 94 percent in 1994 to just 54 percent in 1998. Conversely, the proportion of Type B certificates transferred increased from just 6 percent in 1994 to 43 percent in 1998. The average number of A-2 certificates transferred was 573 in each year, accounting for 0.5 to 2.2 percent of the total number of certificates traded. Since the first full trading season (1994), the total number of certificates traded in each year remained relatively stable from 1995 through 1997, averaging 55,000 certificates. The total number of transfers declined approximately 35 percent 1998, likely due to the 10 percent reduction planned for the end of the season (i.e., prior to the 1998-98 season). This contrasts with initial assumptions by Orbach – reviewed in Section 3.2.3 – that predicted transfer activity would decline at a rate equal to the mandated certificate reductions (10 percent in three of the years, zero percent in others).

The total transfers in Table 4-5 can be compared to those projected before the start of the program. The DNR assumed that five percent of the total number of certificates would be transferred annually (Table 3-2). A five percent transfer rate was observed during the initial preseason period, but the rate increased to twelve percent and averaged above eight percent from 1994 through 1999. Consequently, the initial projection underestimated transfer activity.

Since sales of certificates to non-family members are subject to a surcharge payment equal to 25 percent of the sales price, it is useful to examine the number of Type A certificates transferred out of the family. From 1994 to 1999, 231,913 Type A certificates (A-1 and A-2) were transferred. Of the total, 229,619 (99 percent) were transferred out of the immediate family.

Given the variability in total number of transactions (Table 4-4) and the total number of certificates transferred (Table 4-5), it is unclear whether there is a trend in the average number of certificates traded. Table 4-6 shows a decline in average number of certificates transferred (per trade) from 354 in 1994 to 157 in 1997, a decline of 55 percent. However, the average size of each transaction increased 25 percent in 1998. Single transactions involved as few as 3 and as many as 2,468 certificates. Note that Type-B transactions involved more certificates on average in each year.

Table 4-6. Average Number of Certificates Transferred by Type, 1994-98

Year	Type A-1	Type A-2	Type B	Average
1994	345	0	444	354
1995	289	255	413	328
1996	237	139	435	263
1997	113	78	329	157
1998	130	160	352	197

4.6.3. Number of Individuals Transacting

In this analysis, trap certificate account numbers are used to determine the number of individuals. Since an individual can have multiple accounts, the figures in this section may overestimate the number of participants. The use of endorsement numbers would overestimate participation for the same reason. Given that there were very few multiple account owners (0.2 percent), this bias is assumed small.

Between the 1994 and 1998 seasons, 1,206 individuals (31 percent of the total number involved in the TCP) participated in at least one transaction. Specifically, 429 individuals bought and 898 individuals sold at least one certificate, which indicates that several individuals bought and sold. The number of individuals that participated in a trade as either a buyer or seller, and the total number of traders, are summarized in Table 4-7. Since an individual can buy, sell, and participate in the transfer market in successive years, the number of individuals cannot be aggregated across years or by type of participant (i.e., buyer or seller); summation would overestimate the unique number of participants in the transfer market.

Table 4-7. Number of Unique Buyers and Sellers Involved in a Transaction, 1994-98

Year	Sellers	Buyers	Total
1994	199	174	367
1995	119	125	241
1996	173	115	283
1997	329	140	452
1998	147	94	234

The number of sellers has exceeded the number of buyers in each year except 1995, when the fewest number of sellers were recorded. The number of sellers peaked in 1997 at 329, more than double the corresponding number of buyers. The number of buyers was highest in the first full year of trading. The fact that, overall, the number of sellers was larger than the number of buyers, helps to explain the increase in concentration of certificate holdings examined in Section 4.3.

The breakdown of buyers and sellers by number of transactions during the program is presented in Figure 4-3. Overall, buyers transacted more frequently. During the five seasons, 84 percent of sellers transacted only once. For comparison, from 1994 to 1998, only 51 percent of buyers transacted only once while 45 percent purchased at least twice. Four percent of buyers bought more than 25 times.

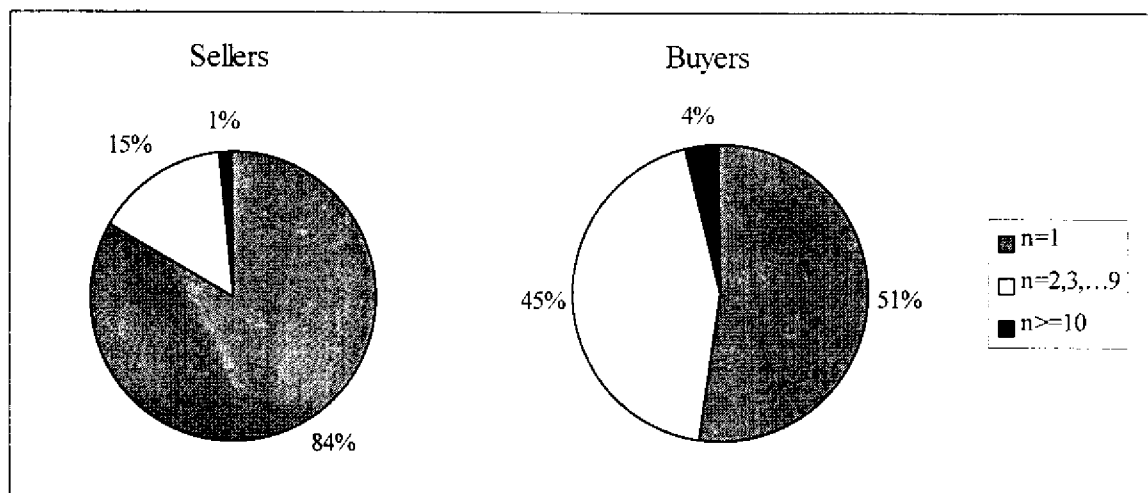


Figure 4-3. Percentage of Sellers and Buyers by Number of Transactions (n)

The extent of multiple transactions by individuals within seasons is presented in Table 4-8. The majority of individuals, from 73 to 85 percent in each year, did not participate in multiple transactions. The proportion of individuals that have participated in multiple transactions -- as a seller or buyer -- fell from 27 percent in 1994 to 15 percent in 1996, but rebounded to 23 percent by 1998. In each year, the proportion of “repeat” buyers has exceeded that of sellers.

Table 4-8. Proportion of Sellers and Buyers who Transacted at least Twice, 1994-98

Year	% Sellers	% Buyers	% Seller or Buyer
1994	19	34	27
1995	20	24	24
1996	9	21	15
1997	9	37	20
1998	14	34	23

In addition to noting the extent of repeat trades in a given year, it is also interesting to note the extent of trading activity between years. For example, 73 people traded in both the 1994 and 1995 seasons, 53 traded in 1995 and 1996, 43 traded in 1996 and 1997, and 62 traded in 1997 and 1998. Transacting in consecutive years may reflect one or more of the following:

- (1) the adjustment in trap numbers necessary to attain the most profitable size fishing operation given the scale of remaining inputs (e.g., vessel size);
- (2) the adjustment of traps necessary to either correct for imperfections in the original allocation of certificates or compensate for losses following a mandated reduction; and/or
- (3) speculative activity in the market for certificates.

4.7. Certificate Holdings by Geographic Region

The top five counties, in terms of the number of certificates held in the county where the owner resides (not the area where the traps are fished), have remained unchanged since the inception of the TCP. These counties are listed in Table 4-9 with the total number of certificates held during the 1992-93 and 1997-98 seasons and the percentage change in the number of certificates held. The number of certificates held in each county decreased since the inception of the TCP and, although the ranking of counties did not change, the program has produced relative changes in holdings across counties. As already noted, these changes do not necessarily reflect changes in the location of fishing activity or a change in the number of participants.

Table 4-9. Number of Certificates held by Top Five Counties in 1993 and 1998

County	Year		Change
	1993	1998	
1. Monroe	549,015	428,411	- 22 %
2. Dade	121,480	89,007	- 27 %
3. Broward	15,275	5,029	- 67 %
4. Palm Beach	12,823	3,669	- 71 %
5. Collier	5,114	2,519	- 51 %

The number of certificates held in the top two counties – Monroe and Dade – fell 22 and 27 percent, respectively. This decrease is generally consistent with the overall reductions. However, the share of the total number of certificates held in these counties increased from 92.5 to 95 percent. Broward and Palm Beach counties – the third and fourth “largest” – lost approximately 70 percent of their certificates during the initial six years of the TCP. The total number of certificates held in Collier County fell by nearly half.

Given that the mandated reductions would affect total certificate holdings across counties equally and that the number of abandoned certificates is relatively small (less than five percent), transfers are the primary cause of the significant reduction in certificates held in Broward, Palm Beach, and Collier counties. Conversely, net transfers have nearly offset the effect of mandated reductions in Collier and Sarasota counties.

Individuals in the Florida Keys (Monroe County) continue to hold the majority of certificates. Within the Keys, certificate holdings were grouped into the following three regions (by zip code) in order to further examine geographic concentration:

- (1) Upper Keys: Northernmost islands including Key Largo (33037) and Tavernier (33070);
- (2) Middle Keys: Islamorada (33036), Long Key (33001), Marathon (33050), and surrounding keys;

- (3) Lower Keys: Southernmost islands including Big Pine Key (33043), Summerland Key (33044), and Key West (33040-2).

Figure 4-4 shows that the distribution of certificates changed slightly from 1993 to 1997.²⁴ In particular, trap certificate ownership is moving further north. Proportional holdings in the Lower Keys (the islands farthest from the mainland) fell from 48 percent to 42 percent while holdings in the Middle and Upper Keys increased from 52 percent to 58 percent.

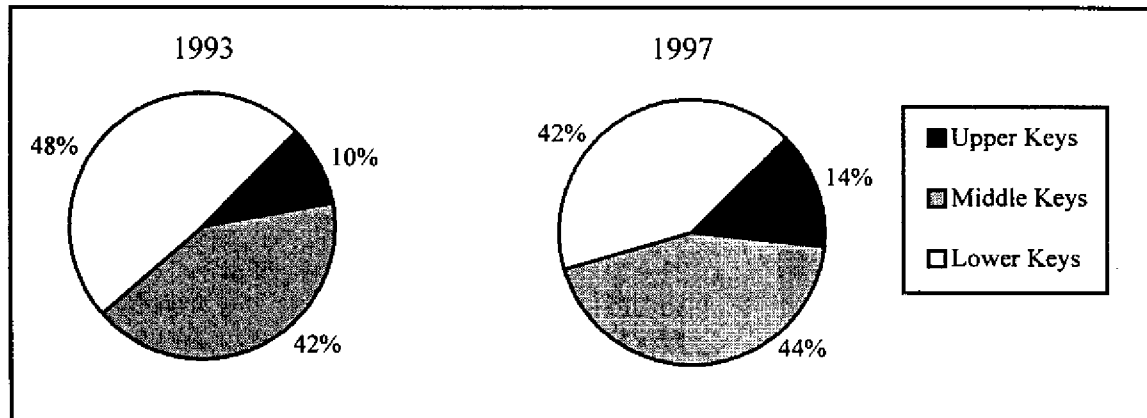


Figure 4-4. Geographic Dispersion of Certificates in the Florida Keys, 1993 and 1997

4.8. Certificate Prices

4.8.1. Certificate Prices Reported to the FDEP

The price of each certificate sold under the transferability clause of the TCP (Florida Statute 370.142(2)a.1) is reported on the notarized Spiny Lobster Trap Certificate Transfer Form (DEP 20-173-FMP). The statute requires that certificates be transferred for a “fair market value,” which was interpreted as the “actual price paid for each certificate” by the FDEP (62R-18.002(9)). The term “fair” was replaced with “actual” during the 1998 legislative session. In addition, the transfer form states that the “certificate purchase price should be in addition to the annual tag fee paid by the seller” and that the “market price of certificates should be taken into consideration.” For example, the DNR estimated the market price of a certificate would be \$25 based on the estimated value of landings that would result from certificate ownership and use of a corresponding trap for a year (i.e., 7 pounds per trap at \$3.50 per pound in 1991; Table 3-2). Following a presentation of certificate prices reported to the FDEP, the question of whether these prices represent the “fair market value” of the certificate is addressed.

²⁴ The updated data from FDEP, for the 1998 and 1999 seasons (1997-98 and 1998-99), did not include sufficient geographic information to update Figure 4-4.

In this report, two methods were used to calculate average certificate prices reported to the FDEP. The first, a simple average, was found by summing the reported prices paid for each and dividing by the number of transactions (Table 4-4). The second method used a weighted average price calculated by multiplying the number of certificates in each transaction by the price per certificate, summing the value, and dividing the product by the total number of certificates exchanged. The weighted price accounts for the possibility that sellers accept a lower unit price for the opportunity to sell a larger number of certificates (i.e., volume discounts).

The observed price range, standard deviation of the simple average price, and the average prices (simple and weighted) are presented in Table 4-10. The A-2 certificate transfers are not included since there were very few transactions, only 15 of the 1,175 transactions from the 1993-94 through 1997-98 seasons involved A-2 certificates (Table 4-4). The simple average (nominal) prices for A-1 and B certificates rose steadily – by approximately 300 percent – from 1994 to 1998. The average price of a Type A-1 certificate increased from \$1.94 to \$7.73, while the average price of Type B certificates increased from \$4.92 to \$19.96.

Table 4-10. Reported and Average Transfer Prices by Certificate Type, 1994-98

Certificate Type	Year	Number of Transactions	Observed Price Range	Standard Deviation	Average Prices	
					Simple	Weighted
A-1	1994	247	\$ 0.50-20.00	\$ 2.95	\$ 1.94	\$ 1.60
	1995	147	0.50-11.00	3.43	3.18	2.66
	1996	188	0.75-35.00	8.40	6.86	4.71
	1997	339	0.75-55.00	9.08	6.91	4.47
	1998	147	0.75-50.00	10.63	7.73	6.51
B	1994	13	0.50-15.00	5.05	4.92	3.61
	1995	27	0.50-23.00	7.37	6.67	4.92
	1996	17	0.75-35.00	12.63	8.21	4.30
	1997	62	0.75-65.00	17.54	13.14	10.50
	1998	43	0.75-65.00	22.02	19.96	10.43

The highest reported price of a trap certificate increased from \$20 in 1994 to \$65 in 1997 and 1998 trading seasons. This increase in the observed price range explains the increase in the standard deviation, however, we would expect the standard deviations to fall if the transfer market worked properly (in a competitive market prices should converge over time). Note that the standard deviations are greater than the corresponding average prices. This is due to the reporting of minimum prices, which is discussed below.

In each year and for each type of certificate, the weighted prices are lower. Overall, the weighted prices for Type A-1 and B certificates averaged 23 percent and 34 percent, respectively, below the unweighted price. A lower weighted price indicates that discounts may have been offered for high-quantity purchases. As with the simple averages, the weighted average price for Type B certificates exceeded the weighted average price of the A-1 certificates in each year. This discrepancy may reflect the incentive to report the annual fee (cost of the certificate) as the sale price for Type A-1 certificates that are subject to the surcharge. This practice would reduce the payment required on sales to non-family members.

Overall, from 1994 to 1998, the price of a Type B certificate averaged \$12.69, 135 percent above the average price of an A-1 certificate (\$5.35) and nearly 265 percent above the price of an A-2 certificate (\$3.48). It is not surprising that A-2 certificates were transferred for a lower price, on average, since they represent transfers among family members. Similarly, it is not surprising that Type B certificates had the highest reported price since they have already been subject to the 25 percent surcharge. What may be surprising is the magnitude of the difference between the average prices (less than \$13) and the predicted prices (\$25 to \$30; Table 3-2 and footnote 13). The highest reported price did, however, reach \$35 during the 1995-96 trading season and \$65 in the following two seasons.

Given that the observed price of a trap certificate should reflect its "fair market value" and at least equal the annual fee (Florida Statutes 370.142(2.a.1)), no certificates have been reported as being sold for less than \$0.50 through the 1995 season (1994-95) and \$0.75 through the 1998 season (1997-98). Certificate prices that were equal to the annual fee are referred to as "base prices." The percentage of transactions in each year that involved base prices are shown in Table 4-11.

Table 4-11. Percentage of Transactions with Base Prices by Certificate Type, 1994-98

Year	% Type A-1	% Type A-2	% Type B
1994	51	0	31
1995	39	33	37
1996	19	0	35
1997	23	25	16
1998	17	0	7

During the 1994 season, almost half of all transactions for A-1 certificates and one-third of transactions involving Type B certificates were reportedly exchanged at the base price. By 1998, the proportion of reported base prices fell to 17 and 7 percent, respectively, for Type A-1 and B certificates. The transactions that involved base prices were likely not reliable reflections of the actual price used in exchange. This is because it was unlikely that a seller would knowingly sell a trap certificate for \$0.75 when the current annual harvest per trap was approximately 12 pounds, the ex-vessel price per

pound was approximately \$3.80, and the certificate could be used as long as the TCP is in effect. The reporting of minimum prices is presumed, therefore, to result from the 25 percent surcharge since a lower reported price translates into a lower total payment to the FDEP. Since it is possible that minimum reported prices may not reflect the true exchange price, the average prices are re-calculated using only non-base prices.²⁵ These “trimmed” average transfer prices are presented in Table 4-12. On average, the trimmed average prices for A-1 and B certificates – the highest averages – were 82 and 107 percent higher, respectively, than the lowest average prices, which were the simple averages from Table 4-10. This was expected since the lower base prices were removed from the calculation of the trimmed averages.

Table 4-12. Reported Minimum and Average Trimmed Transfer Prices by Certificate Type, 1994-98

Certificate Type	Year	Number of Transactions	Minimum Reported Price	Standard Deviation	Average Prices	
					Trimmed	Trimmed & Weighted
A-1	1994	120	\$ 0.61	\$ 3.67	\$ 3.45	\$ 2.70
	1995	90	1.00	3.43	4.88	3.79
	1996	152	1.00	8.74	8.31	6.23
	1997	262	1.00	9.61	8.72	5.66
	1998	122	1.00	11.15	9.17	7.28
B	1994	9	1.00	4.91	6.89	7.25
	1995	17	1.00	7.10	10.29	9.79
	1996	11	1.00	14.28	12.27	4.77
	1997	52	1.00	18.22	15.52	11.97
	1998	52	1.00	22.18	21.40	14.15

The average trimmed prices for A-1 certificates both rose approximately 168 percent from the 1993-94 to 1997-98 seasons. The increases in average B prices – 211 percent for the trimmed and 95 percent for the trimmed and weighted – were not identical. The average B prices remained higher than the average A-1 prices in general, despite the exclusion of base prices. Consequently, the reported A-1 certificate prices – although not specified as equal to the annual fee – were under-reported. For example, in 1998, the average trimmed transfer price for a B certificate was more than 130 percent higher than the reported average trimmed price of an A-1 certificate.

²⁵ Prices close to the base price (i.e., the cost of the tag) may also be underreported such that the trimmed averages may still be biased downward and not reflect the “fair market value” of the certificate. Given that these numbers are presented for comparison and not interpreted as the observed fair market value, the trimmed averages exclude only the transactions at the base price.

The standard deviations associated with the trimmed average prices are, in general, higher than the standard deviations of the averages that include the base prices. Given the trimmed average prices are higher, the standard deviations are lower relative to the average. The continued increase in standard deviations reflects the increase in the highest reported transfer prices – from less than \$20 to over \$55 per certificate – which were unaffected by removal of only the lowest reported prices. Note that the minimum prices (i.e., \$1) are still relatively low.

4.8.2. The Average Transaction

Using the trimmed and weighted average prices for A-1 and B certificates (Table 4-12), the average cost of a transaction – involving each type of certificate – was calculated. This information, presented in Table 4-13, can provide an indication of the effect of the surcharge (which will only affect the price of Type A certificates) and trends in the size and corresponding value of each transaction.

Table 4-13. Average Number and Cost of Certificates Transferred by Type, 1994-98

Year	Type A-1		Type B	
	Number of certificates	Total cost	Number of certificates	Total cost
1994	345	\$ 931	444	\$ 3,219
1995	289	1,095	413	4,043
1996	237	1,477	435	2,049
1997	113	753	329	3,938
1998	130	936	352	4,981
AVERAGE	223	\$ 1,038	395	\$ 3,646

The total cost of the average transaction involving B certificates – which are unaffected by the surcharge – was 250 percent higher than the total cost of the average transaction involving A-1 certificates. The total cost of the average transaction involving Type A-1 certificates equaled \$1,038 and involved 223 certificates at an average price of \$5.13 per certificate. The average transaction involving Type B certificates cost \$3,646 and involved 395 certificates at \$9.59 per certificate. The average transaction involving B certificates involved 77 percent more certificates, which sold for an 87 percent higher price. Although the average total cost of transactions involving B certificates exceeded that of A-1 transactions in each year, no trends are observable in the total cost of either type from 1994 to 1998. That is because interyear changes in the average price were unrelated to the change in the average number of certificates traded. For example, from 1994 to 1995 the average price and number of A-1 certificates traded increased, but the increased average price of a B certificate was accompanied by a decrease in the average number of certificates traded.

4.8.3. Reported Leasing and Expected Sales/Purchase Activity from a Survey of Industry Participants in 1996

As part of this research project, a survey of commercial spiny lobster fishermen was conducted in 1997. Full results of the survey are reported in the companion publication, *Bioeconomic Models of the Florida Commercial Spiny Lobster Fishery* (Florida Sea Grant Report No. 117). Participants were asked several questions pertaining to the 1996-97 fishing season, including leasing activity (no participants reported purchasing certificates). These reported lease prices are compared to sales prices reported to the FDEP – summarized in Tables 4.11 and 4.12 – during the same time period. In addition, respondents were asked if they expected to sell or purchase certificates within the next two years. If such activity was anticipated, respondents were asked to reveal the expected price. These expected transfer prices were also compared to the sales prices reported to the FDEP.

A total of 63 certificate holders residing in the Florida Keys (Monroe County) – grouped into the three distinct regions defined in Section 4.7 – were surveyed. Of the total surveyed, 35 percent (22 individuals) reported leasing trap certificates in 1996. The 22 respondents leased a total of 8,049 certificates. The number of certificates leased for the season ranged from 20 to 1,875. The lease price paid per certificate ranged from \$0 to \$20. On average, each respondent leased 366 certificates at \$11.25 each; the total cost of a lease averaged \$4,070.

The reported leasing activity by region is summarized in Table 4-14. The average total cost of a lease ranged from a low of \$2,200 in the Upper Keys to a high of over \$5,400 in the Middle Keys. Although the region with the lowest reported average total lease cost also had the lowest average reported lease price (and vice versa), the average number of certificates leased varied considerably by region. The Middle and Lower Keys – which include the cities of Marathon and Key West – averaged between 420 and 471 certificates per lease, which is at least 146 percent higher than the 171 certificates involved in the average lease in the Upper Keys (including residents of Key Largo, Tavernier, and Long Key).

The minimum zero price reported in the Upper Keys region contributed to the relatively low average price. Since the value of each certificate is most certainly positive, the weighted average price may provide an improved estimate of the average certificate lease price. The weighted average price of a certificate in the Upper Keys equaled \$12.90 (with the zero price) compared to \$11.48 for the Middle Keys and \$10.45 for the Lower Keys. These prices are likely closer to the true value of a certificate for a single season. The lower average price for the Lower Keys may reflect the (1) larger supply of certificates in that region, and/or (2) the additional price information that can be obtained through such sources as the *Keynoter* newspaper, which is published in Key West. This publication regularly contains advertisements with offers for the purchase, sale, or lease of spiny lobster trap certificates.

Table 4-14. Reported Leasing and Expected Sales/Purchase Activity

	Upper Keys	Middle Keys	Lower Keys
Leasing Activity in 1996:			
Number of Respondents	6	6	10
Average Value of Lease	\$2,200	\$5,405	\$4,390
Lease Price per Certificate:			
Average Price	\$10.50	\$12.58	\$10.90
Price Range	\$0-\$20	\$10-\$15	\$10-\$15
Number of Certificates:			
Total Leased	1,023	2,826	4,200
Average Leased	171	471	420
Range	20-400	80-1,895	100-1,000
Expected Sales/Purchases in 1998:			
Number of Respondents			
Planning to Sell Certificates	0	1	2
Expected Sales Price	NA	\$75	\$67.50
Price Range	NA	NA	\$60-\$75
Average Quantity	NA	20	1,063
Quantity Range	NA	NA	1,018-1,108
Number of Respondents			
Planning to Buy Certificates	8	8	9
Expected Purchase Price	\$53.75	\$61.87	\$68.89
Price Range	\$35-\$70	\$40-\$80	\$55-\$100
Average Quantity	378	584	482
Quantity Range	120-1,200	140-1,450	40-1,500

Note: An "NA" indicates that the statistic is not applicable.

In addition to leasing activity, the survey also asked respondents how much they expected to pay (or receive) if they were planning to buy (or sell) certificates in 1998. Table 4-14 shows that 25 of the 28 respondents reporting buy or sell plans were expecting to purchase additional certificates. The average prices ranged from approximately \$54 per certificate in the Upper Keys (for an average of 378 certificates) to \$69 per certificate in the Lower Keys (for an average of 482 certificates). Overall, the expected price for fishermen planning to purchase certificates in 1998 (from the Keys survey) averaged \$61.80 (from \$35 to \$100) and the expected sales price for fishermen planning to sell certificates averaged \$70.80 (from \$60 to \$75).

Individuals may participate in short-term (seasonal) leases for many reasons. For some, temporary health problems may prevent participation in the short-run. In such cases, leasing his/her certificates to another individual is an obvious solution. For others, the loss of a crew (family) member might necessitate leasing out only a portion of the traps for the season. Conversely, an individual may choose to lease certificates to increase the number of traps if a reduction is planned in the near future; if the certificates

were purchased, the individual would lose 10 percent in the next year. Alternatively, an individual might decide to increase the number of certificates – and, thus, traps – in a given year if he/she believes it might be a “good” lobster season (e.g., higher prices or a larger stock). Of course, temporary conditions in other fisheries in which the fishermen participates may also justify short-term leasing.

The FDEP has kept records – which are admittedly incomplete – on reported leasing activity. During the 1996-97 season, 49,904 certificates were leased (FDEP, personal communication; Keynoter, May 13, 1998). This figure represents approximately 8 percent of the total number of certificates available, but overestimates the net change in certificate holdings. This is because the majority of individuals participating in leasing, participated in multiple transactions. As in the case of multiple and repeat sellers and buyers (Section 4.6.3), such behavior may indicate speculative activity. Note also that seasonal leasing affects the market – supply and demand – for trap certificates since transactions that might be permanent transfers become temporary leases.

It is interesting that the average lease price in 1996 – representing the rental of a certificate for one season – was higher than the average purchase price reported to the FDEP. This finding begs the question, why would an individual lease a certificate when it could have been purchased for the same (or lower) price? Since ownership allows for continued use – and possible future sale – of the certificate, the sales price would be expected to exceed the short-term lease price. Assuming that a profit-maximizing individual would not knowingly choose to lease when purchasing for the same price is an option, several explanations are possible: (1) survey respondents who participated in a lease in 1996 agreed to a price that was too high, (2) the individuals in the survey did not provide the actual transaction price, or (3) the certificate sales prices reported to the FDEP were biased downward. We would, however, argue that the reported lease prices are representative since the survey included individuals who leased out (received payment) and leased in (paid) certificates. Given that the comparison of reported certificate sales by type also confirmed that the surcharge resulted in a downward bias on reported and/or actual transactions price (Tables 4-10 and 4-13), the last explanation seems most plausible. There is, however, no way to determine the extent of this downward bias.

4.8.4. Comparison of Projected and Reported Certificate Prices to their Estimated Value

At this point, it is instructive to compare the reported certificate prices with the price projected prior to the start of the program and the variables that, in theory, should determine their value. The DNR assumed that the price of a certificate would equal the gross revenue obtained from the use of a trap for a year (Section 3.2.2). This approach neglects the costs associated with use of the trap and continued value of the certificate in subsequent seasons. The value of a certificate should reflect the discounted profits (rents) that can accrue from the use of the certificate over the duration of the program. Using a

present value approach, future annual profits from the use of the certificate (and corresponding trap) are discounted and the resulting value equals the fair market value of a certificate.²⁶ The discount rate appropriate for this valuation is likely higher than the market interest rate due to added uncertainty associated with the fishing profession in general, the TCP, and unknown stock conditions that characterize the spiny lobster fishery in Florida (Quigley).

The reported certificate prices ranged from \$0.50 to \$65 but averaged under \$20 (Tables 4-10 and 4-12). In the initial projections, the DNR assumed all certificates would sell for \$25 each (i.e., 7 pounds per trap per year at \$3.50 per pound), although a price of \$30 was also suggested (Orbach). A rough approximation to the annual cost of fishing in the U.S. Southeast – suggested by Kearney-Centaur – is that annual cost equals 63.8 percent of gross revenues. In other words, 36.2 percent of the annual gross revenue derived from the use of a single trap reflects the net returns to a certificate for one season. Using this approach, the expected sales price of a certificate assuming a 1-year time horizon (which would also equal the expected 1-year lease price) can be calculated using the average lobster price and average yield per trap. These parameters are presented with estimates of the expected short-run (one year) price and the observed prices for comparison in Table 4-15.

In 1996, reported certificate prices reached \$35 (Table 4-10), however, the trimmed price of a Type B certificate averaged just over \$12. The reported transaction prices are less than the estimated price – or fair market value for a single season – of the certificate. The observed prices are increasing, however, relative to the expected short-run prices. In 1993, the average observed price was just 22 percent of the expected short run price. By 1996, the observed price had increased to 70 percent of the expected price. Given that the trimmed average price of a Type B certificate increased to \$21.40 in 1998, the observed price would *exceed* the expected short-run price by 22 percent if lobster prices and catch rates remained unchanged.

Table 4-15. The Expected Short-run and Observed Transfer Prices, 1993-96

Fiscal Year	Average Ex-vessel price ^a (\$/lb)	Average Trap Yield (lb/trap)	Certificate Price	
			Expected Short-run (price x yield)0.362	Observed (Type B trimmed)
1993	\$ 3.32	7.4 pounds	\$ 8.89	\$ 1.99 ^b
1994	4.28	9.5	14.71	6.89
1995	4.44	10.4	16.72	10.29
1996	3.79	12.8	17.56	12.27

^a Source: Florida's Marine Fisheries Information System.

^b Price calculated using the reported total transfer and surcharge revenues.

²⁶ Discounting is a technique for calculating the present value of a future stream of net income. This is necessary since current income can earn interest over time, and increase in value, compared to equal income received in the future (Hartwick and Olewiler).

Note that the expected price of a certificate calculated in Table 4-15 is based on the expected revenue from use of the certificate for one year. Certificates are valid, however, for as long as the program continues or until a reduction results in its elimination. Given that the possibility of the program being terminated in the near future is remote and that reductions cannot exceed 10 percent of each persons holdings per year, the certificates should be valued over multiple years. The longer the time horizon considered, the higher the current value of the certificate. Conversely, the higher the net discount rate – indicating the real value of future income is worth relatively less – the lower the current value of the certificate.

For comparison, if the use of one certificate (and the corresponding trap) for one year produces a net revenue of \$17.56 as predicted in Table 4-15, its value over a five-year time horizon – assuming a 10 percent net discount rate – would be \$66.57. This is very similar to a price advertised in the *Keynoter*; the April 29th 1998 issue contained an offer to sell 50 certificates for \$68 each. Extending the time horizon to 10 years with the same discount rate of 10 percent would increase the current value of a certificate to \$107.90.

4.8.5. Summary

Factors that have influenced the reported certificate transfer prices include: (a) the novelty of transferable ownership rights under the TCP; (b) uncertainty about the duration of the program; (c) uncertainty about future certificate reductions – including the specification of the total number to be reduced (i.e., a reduction target) and effects on yield per trap; (d) market imperfections such as difficulty in finding a willing buyer or seller with the desired number of certificates; (e) the surcharge applicable on the transfer of A-1 certificates to non-family members; (f) leasing activity that reduces the market for sales; and (g) potential underreporting of actual sale price. The combination of these factors has contributed to reported average prices that are lower than reasonable estimates of their expected market value.

5. PROGRAM ADMINISTRATION

An issue relating to the performance of the TCP is whether the revenues derived from the program have covered the implementation costs and annual expenses. The 1994 Economic Impact Statement observed:

Initially the program should be self-sustaining. However, the revenues from the sale of trap tags will decline at 10% per year and the revenue from transfer surcharges also will decline, but at an unknown rate. Therefore, it would appear that this program will not be self-sustaining over the intermediate or long term. [FDEP 1994, p.1]

This prediction is especially important given that FDEP is allowed to assess an additional fee – an “equitable rent” – for each certificate as “partial compensation to the state for the enhanced access to its natural resources” (Florida Statutes 370.142(2.a.1)). As of 1998, only annual fees and transfer-related charges have been collected. These revenues are summarized in the following section and then compared to the documented administrative costs.

5.1. Reported TCP Revenues

The TCP generates revenue through the annual certificate fee and transfer activity. The annual certificate fee has increased from \$0.50 to \$1.00 per certificate since 1992 (\$0.50 for fees paid in 1992-94, \$0.75 for fees paid in 1995-97, and \$1.00 beginning in 1998). Since the annual trap fee must be paid at the start of the season, the year in which the fee is paid is the year before the season begins.²⁷ The transfer of certificate ownership provides an additional \$2.00 for each certificate transferred and, if the certificate is transferred outside the immediate family, a surcharge equal to 25 percent of the total value of the transaction (Section 3.1.4).

The Bureau of Finance and Accounting in the Division of Administrative Services at the FDEP provided program revenue data (B. Roberts, FDEP, personal communication). The annual revenues that were credited to the program are presented in Table 5-1. According to the Bureau, the TCP has generated over \$3 million since 1992. The certificate fee, transfer fee, and transfer surcharges accounted for 76, 19, and 5 percent of total revenues, respectively. Total annual revenues increased from approximately \$256,000 in 1991-92 to over \$625,000 in the 1996-97 fiscal year (145 percent), the most recent year for which official figures are available.

²⁷ Recall that throughout this report the fiscal year and fishing seasons are referenced with the year in which the season ended to correspond with the FDEP.

Table 5-1. Reported TCP Revenues, Fiscal Years 1992-93 to 1996-97

Year	Type of Fee			Total Revenue
	Certificate	Transfer	Transfer Surcharge	
1992 ^a	\$ 255,613	NA	NA	\$ 255,613
1993	326,909	\$ 68,892	\$ 17,188	412,989
1994	352,724	181,863	34,689	569,276
1995	466,109	108,764	28,313	603,186
1996	445,742	104,031	50,822	600,595
1997	477,908	107,378	41,374	626,660
TOTAL	\$2,325,004	\$ 570,927	\$172,387	\$3,068,319

^a An "NA" indicates the statistic is not available since the TCP was not in effect.

The TCP was not implemented, however, until the 1992-93 season so the certificate fee assessed in 1991 (for the 1991-92 season) should not technically be attributed to the program. The 1991 fee was an attempt by the department to determine the total number of traps in the fishery. Consequently, the number of tags was unrestricted. Since fishermen believed that the number of certificates they would receive under the program – which had been passed by the legislature but not yet implemented – might be based on the number of tags purchased in 1991-92, many fishermen purchased more tags than they needed (A. Cordero, FDEP, personal communication). Using the total revenue collected on tag sales during the 1991-92 season and the cost of each tag (\$0.25), an estimated 1,022,452 tags were sold.

The reported revenue from the 1995 certificate fee – for the 1994-95 season – is nearly \$130,000 above the maximum possible, according to the number of available certificates, the applicable annual fee, and the possible late payments. Specifically, if all certificates available in 1995 were active, \$337,040.50 would have been collected in 1995. In addition, if all late payments from inactive (i.e., unpaid) certificates in 1993 and 1994 were paid in 1995, an additional \$59,187.50 would have been collected. Consequently, the maximum possible 1995 revenue from the annual certificate fee totals just \$396,228, which is \$69,881 less than reported. The most reasonable explanation is that collections from other revenue sources were inadvertently deposited in the TCP account (R. Schlieder, FDEP, personal communication).

Given that revenues from the 1991-92 season were not mandated under the TCP, and that nearly \$70,000 of the certificate revenues in 1995 cannot be justified, the total certificate revenue in Table 5-1 is overestimated by at least \$325,494. With this revision, the annual certificate fee accounted for 73 percent (\$1,999,510) of total revenues (\$2,742,825). Transfer fees and surcharges accounted for 21 and 6 percent, respectively.

In each year, the certificate fee has accounted for the majority of TCP revenues. The relative importance of this revenue source has varied, however, with the annual fee and the volume and value of transfers. Revenues from the annual certificate fee have

increased by more than 46 percent, from \$326,909 in 1993 to \$477,988 in 1997. In addition, total revenue from the fee is expected to generate nearly \$525,000 in the 1998-99 season – assuming the observed non-payment rate of 5 percent – since approximately 552,078 certificates will be available and the annual fee will increase 33 percent in 1998 (from \$0.75 to \$1).

Revenues from certificate transfers have remained relatively stable over the past three years despite (1) a decrease in the total number of certificates, (2) a decline in the total number of certificates traded, and (3) an increase in the average sales price. From 1995 to 1997, the total number of certificates transferred ranged from 52,402 to 54,382 (Table 4-5). The corresponding total transfer revenues have ranged from \$137,077 to \$154,883.

Table 5-1 does not include revenues from licenses and/or permits required to participate in the commercial industry since they are not a part of the TCP. The SPL, for example, is required for commercial participation in any Florida saltwater fishery. Consequently, the revenue from these licenses should not be attributed solely to the lobster fishery, especially since the majority of lobster fishermen in Monroe County participate in other fisheries (Milon et al.; Shivilani and Milon; Prochaska and Williams). Another “license” that is required – but not officially part of the TCP since it was instituted independently – is the crawfish trap number or “C” number (Florida Administrative Code, Chapter 46-24.002(2)). The revenue obtained from this license is affected, however, by the program if the mandated trap reductions are reducing the number of fishers; as of the 1996-97 season, the total number of participants has declined by 287 (Figure 4-2; Appendix B). Footnote 5 summarized the costs of these licenses.

Other revenue sources associated with the TCP include civil penalties, tag replacement, and trap retrieval. In 1997, these revenues amounted to approximately \$45,000, of which 80 percent was from trap retrieval fees. The civil penalty revenues do not reflect the total sum of revenues from all citations issued since judges can reduce or drop the fine (R. Schlieder, FDEP, personal communication). Consequently, civil payments cannot be used as an indicator of law enforcement effort in the spiny lobster fishery. Given that revenues from civil penalties are relatively small (e.g., \$6,600 in 1997), inconsistent, and irregular, they are not included in this analysis. Tag replacement revenues (FDEP Code 2121) were also relatively small – equaling just \$2,600 – in 1997. This revenue equals the FDEP payment to the vendor in order to have the tag reproduced. Similarly, revenue from trap retrieval during the off season (FDEP Code 2068) just covers the cost of the contract including administration.²⁸ Given that the tag replacement and trap retrieval fees are set to cover costs, these activities are not included in the revenue summary.

²⁸ The FDEP pays \$8 for each trap removed (R. Schlieder, FDEP, personal communication) and the fisherman who abandoned the trap is charged \$10 (Florida Statute 370.143(2)). There are some instances where fishermen are not assessed the retrieval fee (e.g., following a major storm). In such cases, the trap retrieval is subsidized at the rate of \$4 per trap (anonymous reviewer).

The projected revenues overestimated the actual revenues in the first season by 65 percent. The initial projections (Table 3-2) estimated revenue at \$684,375, but only \$412,989 was reported for 1993 (Table 5-1). Approximately five percent of the initial overestimate is due to the difference between the number of certificates allotted (724,232) and the assumed number (750,000). The projected revenues also assumed that the annual fee would be collected on all available certificates; however, approximately five percent of the certificates were inactive in 1993. This discrepancy accounts for an additional 13 percent of uncollected revenue. The total transfer revenue – fees plus surcharges – in the first year was estimated at \$309,375, but only \$86,080 was collected. Specifically, 82 percent of the overestimate was due to incorrect assumptions regarding transfers. The majority of the overestimate (in total and from transfers) resulted from an incorrect assumption regarding the transfer price. In particular, the assumed \$25 per certificate sales price was approximately \$20 higher than reported. Given that reported transfer prices averaged less than \$5 per certificate, the projected surcharge revenue overestimated the actual revenue by \$217,187.

5.2. Reported TCP Costs

In 1994, the FDEP calculated the program implementation and start-up costs. These costs are compared to the original projections (Table 3-1) in Table 5-2. By 1995, the projected cost was 26 percent less than actual expenses. The majority of the discrepancy involved costs associated with the tags. The original budget underestimated the costs of producing and distributing the tags by 42 percent and salary expenses by 10 percent. In addition, miscellaneous expenses totaling over \$33,000 – for supplies, notices of impending regulatory changes, room rental for public meetings, and legal advice – were not considered in the original budget.

Table 5-2. Comparison of Projected to Actual Cost Estimates in 1995

Expense	Projected (DNR, 1991)	Actual (FDEP, 1994) ^a
Salaries	\$ 188,722	\$ 209,913
Program Implementation and Software	25,000	10,322
Tags and Tag Distribution	100,000	171,400
Other (legal, rentals, supplies, notices)	0	33,211
TOTAL	\$ 313,722	\$ 424,846

^a Tables I-1 and I-2.

The Division of Marine Resources provided information on program costs incurred from 1995 through 1997. Annual costs during this time ranged from approximately \$467,000 to over \$518,000. These costs are disaggregated in Table 5-3 by agency, namely: the Division of Marine Resources, the Florida Marine Fisheries Institute (FMRI), and the OFMAS. In summary, costs were incurred for research, office

operations, data processing, meetings of the appeals board, salaries associated with the program, production and distribution of the trap tags, and miscellaneous (unspecified) division expenses.

Table 5-3. Actual Costs Incurred by the Division of Marine Resources for the TCP, 1994-95 to 1996-97

Agency (Cost Code) ^a	FY94-95	FY95-96	FY96-97
Division (7420.0000.000):			
Unspecified	\$ 77,853		
Appropriation and service charge		\$ 136,801	
Data processing and service charge			\$ 70,441
FMRI:			
Office operations (x.2000.000)	21,517		
Research (x.2050.200)	84,797	90,293	134,470
OFMAS:			
Unspecified (x.9010.300, x.9010.100)	2,763	8,695	10,383
Appeals board and TCP (x.9010.600) ^b	18,723	14,667	16,322
Crawfish trap tag (x.9020.300)	261,384	268,029	264,806
TOTAL	\$ 467,037	\$ 518,485	\$ 496,422

^a In 1995 the eleven-digit code for the Division of Marine Resources was 7420.0000.000. The first four digits were changed to 3720 following the 1994-95 season. The agencies within the division share the common first four-digit code, which is represented by x in the table.

^b The appeals board ceased to function following FY94-95. In the remaining fiscal years, the x.9010.600 cost code was titled the "Lobster Trap Certificate" instead of "Appeals Board" and may represent the cost of administrative hearings carried out by OFMAS.

Division expenses ranged from approximately \$70,000 to over \$136,000 per year. The FMRI – the agency responsible for collecting, summarizing, and reviewing all statistics related to the fishery and the TCP – accounted for \$90,000 to \$134,000 of annual revenues. Collectively, these expenses were 39 to 44 percent of annual costs. The OFMAS accounted for the majority of costs, nearly 60 percent of total annual expenses. Overall, the most expensive component of the program – accounting for, on average, 55 percent of total costs – is the cost to produce and distribute the tags.

Costs incurred by the Marine Fisheries Commission (MFC) and the Florida Marine Patrol (FMP) were not included in this analysis because they do not disaggregate costs by fishery. For example, the MFC receives a share of TCP revenues, approximately \$15,000 per year, and spiny lobster licensing fees; however, the monies from all sources are aggregated. Similarly, the FMP checks for any violation, not just those relating to the spiny lobster fishery or the TCP in particular. More importantly, however, the number of citations does not indicate whether the violation involved a commercial or recreational harvester. Over the course of the program, 380 citations have been issued for violations of the minimum size (80 percent), gear (12 percent), and season regulations (8 percent), respectively (i.e., violations of Florida Administrative Code Chapter 46-24). From 1993

to 1997, an average of 76 citations have been issued annually, from a low of 55 in 1996 to a high of 104 in 1994. For comparison, 152 citations were issued in 1992, the year before the TCP was implemented (M. Horvath, FMP, personal communication). In summary, to meaningfully examine MFC and FMP costs specifically related to the TCP, the proportion of time spent on the lobster fishery – the commercial sector in particular – would have to be determined.

For comparison to Table 5-3, the DNR initially projected the annual recurring cost of the TCP to be approximately \$270,000 (Table 3-3). This estimate excluded miscellaneous expenses and costs associated with data processing, research, and the appeals board. Collectively, these excluded costs averaged approximately \$200,000 in fiscal years 1995 through 1997 (Table 5-3). Consequently, excluding these expenses significantly underestimated total costs.

5.3. Net Revenues 1995-97 with Projections through 2001

Reported TCP revenues are shown with program costs, excluding costs incurred by the Florida Marine Patrol and the Marine Fisheries Commission, in Table 5-4. Net revenues have increased from approximately \$7,000 to over \$130,000 from 1995 to 1997. The majority of the approximate \$125,000 increase over the last three years can be attributed to the increased annual certificate fee. During the last two years of the program, the 1995-96 and 1996-97 seasons, the annual fee per certificate was \$0.75, which is 50 percent higher than in the initial years of the program. Despite the recent increase in net revenues shown in Table 5-4, the cost to produce the tags – the most expensive component of the program – is expected to increase when the current production contract expires in 1998 (J. Dodson, FDEP, personal communication). Furthermore, given the exclusion of costs associated with law enforcement and the MFC, it is likely that the true costs of the program have exceeded the revenues in previous years, especially 1994-95.

Table 5-4. Estimated TCP Net Revenues Excluding Law Enforcement and the Marine Fisheries Commission, 1995-97

	FY94-95	FY95-96	FY96-97
Reported Revenues	\$ 474,118 ^a	\$ 600,595	\$ 626,660
Actual Costs	467,037	518,485	496,422
ESTIMATED NET REVENUE	\$ 7,081	\$ 82,110	\$ 130,238

^a Since the 603,186 of Table 5-1 contains revenue inadvertently credited to the TCP (see discussion following Table 5-1), the annual certificate revenue is replaced with that which would have been collected assuming all certificates available (Table 3-4) were active (i.e., 100% payment rate) and no late payments.

Using the official certificate numbers (Table 4-1) and reported transfer activity (Table 4-5), revenues can also be approximated for the 1997-98 season. Assuming a 95 percent payment rate, the \$0.75 per certificate annual fee would generate \$431,005.50.

The transfer of 35,042 certificates would generate \$70,084, given the \$2 per certificate transfer fee, and surcharge revenues for first-time out-of-family sales were reportedly equal to \$20,144.82. Consequently, total revenues for the 1997-98 should be approximately \$521,234, resulting in a net profit of \$24,812 assuming costs remain unchanged (e.g., increased tag expenses offset fewer tags). The significant decline in revenues (more than \$100,000) was caused by the transfer of fewer certificates.

To further assess the performance of the TCP, Table 5-5 presents net revenue projections – based on alternative transfer assumptions – through the certificate reduction in 2000. Future costs are assumed to remain at the 1996-97 level, hence, reductions in the number of trap tags are assumed to offset increases in production and distribution costs. Revenues from the annual certificate fee – which equals \$1 per certificate – are determined by the number of available certificates in the 1998-99 season (Table 4-1), the mandated reduction in 2000 (assuming an exact 10 percent reduction), and a 95 percent payment rate (no certificates are assumed “abandoned”).²⁹ Although the annual fee accounts for the majority of revenues, revenues are also collected on transfers. There are two sources of transfer revenue, (1) the \$2 per certificate fee and (2) a \$5 per certificate surcharge on the value of transfers to non-family members. To estimate transfer revenues, assumptions must be made regarding the transfer rate (i.e., number or percentage of total certificates expected to be transferred), the average price, and the percentage of transfers subject to the surcharge. Given the importance of each assumption to the resulting net revenue figure – and assessment of the self-sufficiency of the program – we compare three transfer assumptions.

Table 5-5. Projected TCP Net Revenues Excluding Law Enforcement and the Marine Fisheries Commission, 1999-2001

Projections	FY98-99	FY99-00	FY00-01
No Transfers			
Revenue	\$ 516,859	\$ 516,859	\$ 465,173
Cost	496,422	496,422	496,422
NET REVENUE	20,437	20,437	-31,249
Transfers: 5.8% of total, 41.2% out of family @ \$5			
Revenue	644,974	644,974	580,477
Cost	496,422	496,422	496,422
NET REVENUE	148,552	148,552	84,055
Transfers: 5.8% of total, 41.2% out of family @ \$16.67			
Revenue	796,695	796,695	717,052
Cost	496,422	496,422	496,422
NET REVENUE	\$ 300,273	\$ 300,273	\$ 220,603

²⁹ Mandated reductions are applied to each individual so the actual reduction may differ from the projected due to rounding. Abandoned certificates are lost from failure to pay the annual certificate fee for three years.

The first transfer assumption represents a minimum estimate of total revenues by assuming no transfers occur in each year. The second assumes the lowest reported transfer rate (5.8 percent) and out-of-family sales rate (41.2 percent) – both of which were observed in the 1997-98 season. Under the third scenario, the surcharge is assumed to equal 25 percent of the “fair market value” of a certificate for a 5-year horizon and 10 percent discount rate, that is 25 percent of \$66.67 (Section 4.8.4).

The first scenario approximates the minimum expected revenue situation. This scenario would represent fishermen choosing to lease certificates, rather than buy, in order to avoid the newly-instituted \$5 minimum transfer surcharge. Under this scenario, net revenues would decrease from approximately \$20,000 to a net loss of more than \$31,000 following the certificate reduction. Although this scenario assumed costs were equal despite the reduction, the costs of tag production and distribution (i.e., postage) will most likely increase. In addition, recall that these costs excluded law enforcement and expenses incurred by the Marine Fisheries Commission. The revenues, however, also excluded potential transfer revenues. Although these revenues are only collected if transfers are reported (i.e., the revenue is not guaranteed) and will decrease as the total number of certificates subject to a surcharge falls, it is likely that some revenues will be collected.

Under the second assumption, net revenue would equal approximately \$148,500 during the 1999 and 2000 seasons then fall to \$84,000 with the reduction in 2000. The increased annual revenue over the first scenario is divided roughly equally between the \$2 transfer fee and \$5 surcharge on out-of-family transfers. Under these transfer assumptions, total transfer revenues account for 80 percent of total revenues. When the assumed surcharge is increased to the expected value of the certificate, the transfer revenue increases significantly and net revenues in the first two years increase to more than \$300,000 (i.e., 102 percent). In addition, transfer revenues would account for 35 percent of total revenues instead of 20 percent. This scenario would represent the optimistic case where all respondents reported the true value of the transfers. Note again, that these projected surpluses exclude costs incurred by the Florida Marine Patrol and the Marine Fisheries Commission.

The number of traps in 2000-01, projected at 489,655, may still be above the “optimal” number according to a FDEP report and other publications (e.g., Muller et al.). The report, completed in 1996, suggests that the optimal number – defined as the number of traps low enough to maximize catch-per-trap and high enough to maintain current landings – is probably between 250,000 and 500,000 (FDEP 1996, p. 6). Under the current reduction procedure, which restricts annual reductions to 10 percent or less, six additional reductions beyond 2000-01 would be required to reach the lower bound (i.e., 250,000 traps). Such reductions would take at least six years, or 12 years if the every other year policy is continued (i.e., until 2012-13), and significantly reduce gross revenues to the FDEP.

6. SUMMARY AND SUGGESTED PROGRAM REVISIONS

6.1. Summary of Major Findings

1. The TCP reduced the total number of traps in the commercial spiny lobster fishery by approximately 42 to 45 percent during its first five years. In 1991-92, before the TCP, there were between 939,000 and 986,000 traps in the fishery (Hunt et al. 1994 and Hunt 1998). In 1998-99, the FDEP reported a total of 544,062 certificates. The trap reductions have not affected overall catch levels, but have increased the average yield per trap (although not to the levels observed in the 1960s and early 1970s).
2. The volume of certificate transfers was larger than projected, ranging from 6 to 12 percent of the total number of certificates available in any given year. The majority of transfers involved the sale of certificates by the original owner (Type A-1) to a non-family member. Transfers of certificates that were previously sold outside the family of the original owner (Type B) accounted for a larger share of total transfers in recent years. Because certificate leases – which are short-term, temporary transfers – were not addressed in the original statute, information on leasing since the beginning of the TCP is not available. Leasing activity was prohibited during the 1998 legislative session, but the law will not take effect until July 1, 2003.
3. Despite reductions in the total number of certificates, the concentration in certificate ownership is well below the level in many U.S. industries. While the share of the total certificates held by the largest participants increased somewhat under the TCP, the increased concentration is relatively low. Given program restrictions that limit individual ownership of certificates, high concentration ratios – compared to national standards – cannot be achieved in this fishery. This restriction does not ensure, however, that local problems of market control might not occur.
4. The TCP has not affected the ranking of the top five counties in terms of the number of certificates held. Monroe and Dade Counties continue to be home to the vast majority of certificate owners (more than 90 percent). During the TCP, the mandated reductions were offset by transfers (to increase certificate balances) in these counties. Within Monroe County, where the largest number of certificates are held, the proportion of certificates in the Upper and Middle Keys increased slightly from 1993 to 1997.
5. Average transfer prices reported under the TCP for Type A-1 and B certificates increased annually. The average price of a B certificate was considerably higher than the price of an A-1 certificate, although the number of B transfers was much smaller.

A relatively large percentage of both types of certificates, however, were transferred at the minimum allowed exchange price (especially during the early years). Lower average prices for A-1 certificates are explained, at least in part, by the surcharge assessed on the first transfer of these certificates outside the owner's immediate family. The average reported transfer prices for Type B certificates in 1997 and 1998 were greater than the seasonal lease price given by certificate owners in a survey conducted by the authors.

6. Based on the annual average yield per trap, ex-vessel price for spiny lobster, and a gross revenue adjustment factor, the average annual reported transfer price of an A-1 certificate in 1998 was less than its short-run expected value. Factors that may have contributed to a lower reported transfer price include: (a) the novelty of transferable ownership rights under the TCP; (b) uncertainty about the duration of the program; (c) uncertainty about future certificate reductions – including the specification of the total number to be reduced (i.e., a reduction target) – and effects on yield per trap; (d) market imperfections such as the difficulty in finding a willing buyer or seller with the desired number of certificates; (e) the surcharge applicable on the transfer of A-1 certificates to non-family members; (f) leasing activity that reduces the market for sales; and (g) potential underreporting of actual sales prices.
7. Initial estimates of the administrative costs of the TCP were too low. FDEP has incurred higher costs than anticipated for producing and distributing trap tags and research necessary to evaluate the fishery. Enforcement costs – which accounted for more than one-third of the initial cost estimate – were not included in this comparison because the Florida Marine Patrol does not disaggregate costs by fishery.
8. Initial estimates of the total revenues derived from certificate fees, transfer fees, and surcharges under the TCP were too high. Although revenues from certificate fees have been consistent with expectations, revenues from transfer fees have been higher due to a larger-than-expected volume of transfers. These transfers, however, have occurred at lower reported prices than initially estimated, resulting in lower surcharge revenues and lower total revenues.
9. Despite higher costs and lower revenues than originally projected, the TCP has resulted in net surpluses for the FDEP. According to the quantifiable costs summarized in this report, the TCP has been self-financing. This conclusion might change if enforcement costs for the TCP were included. In addition, based on current costs and expected future revenues, the TCP may incur a debt in the 2000-1 season given the mandated 10 percent reduction.

6.2. Proposed Revisions for the Trap Certificate Program

Proposal 1. Distribute information on certificate transfers, transfer prices, and average individual trap yields on a regular basis.

Rationale: Buyers and sellers of any good or service benefit from more information about transactions in that market. Information on the number of transactions, number of certificates exchanged, and the transfer price would assist buyers and sellers in making informed decisions. While informal methods have developed to provide this information, considerable misinformation appears to exist as evidenced by the wide range in reported prices. Similar fishery management programs in the United States with individual transferable permits – such as the Alaska Sablefish and Halibut fisheries – have attempted to solve this problem by regularly posting program information on the internet. In the case of the Sablefish and Halibut fisheries, the Alaska Regional Office of the National Marine Fisheries Service compiles program statistics and other information related to participation in the fishery (e.g., eligible permit buyers, transfer forms, and current permit holders). The web site – found at <http://www.fakr.noaa.gov/ifq/ifq.htm> – also educates and informs current and future participants and, thereby, facilitates the efficient transfer of permits. In addition, information on average trap yields, although currently confidential at the individual level, would address the question of weak enforcement in a simple and cost-effective manner (since an individual's annual average trap yield should not differ appreciably from the industry average). This type of solution is especially appealing given the high cost of a full-time enforcement officer for spiny lobster. The approach may be particularly effective given that participants are located within relatively close proximity to one another and peer pressure can be significant.

Proposal 2. Eliminate the 25 percent surcharge on sales of Type A-1 certificates out of the family.

Rationale: The surcharge penalizes transfers of Type A-1 certificates relative to other certificate types and creates an incentive to misrepresent the actual exchange price. As a revenue source, surcharge fees have accounted for only six percent of total revenues. It is unlikely that the FDEP could institute any field practices that would end exchange price misrepresentation and thereby increase surcharge revenues. A minimum transfer surcharge of \$5 per certificate was, however, adopted during the 1998 legislative session. This legislation, which took effect in 1998, further exacerbates the problem of accurate reporting of A-1 transfer prices. It is likely that a large number of the A-1 certificates sold out-of the family will be reportedly sold for \$20, which translates into a \$5 surcharge at the 25 percent rate. This rule also reduces the potential for larger surcharges from individuals that would otherwise report a price higher than \$20 (recall that average reported transfer prices increased each year). In addition, since leases have been explicitly allowed until 2003, it is possible that leasing activity will replace ownership

transfers and the state will forgo both the \$2 transfer fee and the \$5 surcharge, thereby reducing total revenues and possibly jeopardizing the self-sufficiency of the program.

Proposal 3. Establish a target number of certificates (i.e., determine the total number of certificates to be eliminated from the fishery).

Rationale: Without information on the extent of future reductions, industry participants are unable to plan ahead. This uncertainty, in addition to the natural recruitment variability, acts to undermine the trap certificate program and the transfer market. By establishing a target for the total number of certificates in the industry, participants could anticipate the effects of future reductions and plan accordingly (e.g., calculate their expected rate of return and either phase out of the industry or acquire additional certificates).

Proposal 4. Eliminate the reallocation of abandoned certificates during years of no reductions as long as the total number of certificates exceeds the target level (Proposal 3).

Rationale: Under current regulations abandoned certificates are permanently retired in years with mandated reductions, but reallocated in other years (Florida Statutes 370.142(2)(c)6). A legislative change to specify that all abandoned certificates “shall become permanently unavailable” – regardless of whether or not trap reductions are mandated – would suffice. Aside from allowing the MFC to meet its overall goal of reducing the total number of traps in a more timely manner, this proposal would (1) reduce traps from participants that have shown disinterest in continued participation in the fishery and (2) eliminate the administrative burden (especially the cost) associated with reallocating certificates.

Proposal 5. Future reductions in the total number of spiny lobster trap certificates – beyond that scheduled in 2000 – should be made through a certificate buy-out program administered by FDEP.

Rationale: Mandated reductions will reduce the total number of certificates to approximately 490,000 for the 2001-02 season. While the “optimal” number of traps depends on a number of factors (Milon, Larkin, and Ehrhardt) – and will ultimately be determined by the Marine Fisheries Commission – the FDEP has suggested between 250,000 and 500,000 traps (FDEP 1996, p. 6). Even though mandated reductions have reduced the total number of certificates to approximately 544,000 for the 1998-99 season, across-the-board reductions in individual certificate holdings are an inefficient approach to reducing total effort. Under a buy-out program, certificate owners would be asked to submit “offers” to sell that would include the number of certificates and a minimum acceptable price (negotiated transfers between willing buyers and sellers would

continue). According to theory, less efficient harvesters should offer certificates for a relatively lower price. The FDEP could then array these offers and select those with the lowest price to purchase and retire.³⁰ Reductions could occur in one or more years until the desired target is achieved. FDEP could also set a maximum price it was willing to pay to avoid unrealistically high asking prices. This reduction scheme is not new, the Conservation Reserve Program – administered by the U.S. Department of Agriculture – used a similar program during the latter part of the 1980s to remove over 35 million acres from agricultural production (Miranowski and Cochran, pp. 434-435). The certificate buy-out program could be financed through, for example, a special fee assessed on all owners. The important advantages of this approach are that it (1) encourages the least efficient harvesters to exit the fishery, (2) provides compensation to those who have participated in the TCP but now desire to exit or downsize, (3) can expedite the removal of traps to the desired level, and (4) is self-financing. In addition, the offer prices elicited through such a buy-out program would provide a more reliable estimate of the “fair market value” of certificates.

The development of a limited entry program for stone crab may include a so-called “passive reduction” plan whereby a fixed proportion (10 percent) of certificates are eliminated following each transfer to a non-family member (Marine Fisheries Commission public workshop, 12/98). If this provision had been included in the spiny lobster trap certificate program, only 34,836 additional certificates would have been eliminated (which is just 4.2 percent of the total number of certificates allocated in the initial distribution and through appeals or 6.4 percent of the total number of certificates available during the 1998-99 season). In addition, there would likely have been fewer certificate transfers due to the disincentive associated with the traps lost (e.g., sellers would only receive the value of the reduced number of traps since buyers would be unwilling to pay for traps they would not receive). A disincentive to transfer would increase the likelihood that marginal harvesters would remain in the fishery.

Proposal 6. Establish restrictions on the total number of harvesters in the commercial spiny lobster fishery such that entry by non-trap gear users is eliminated.

Rationale: Under current regulations, anyone who qualifies for an SPL with a Restricted Species Endorsement can also obtain a Crawfish License which allows harvests in excess of the recreational bag limit. Consequently, the TCP limits effort in the trap fishery, but open-access prevails in the use of non-trap gear. In recent years, the share of commercial harvests by non-trap gear has been less than six percent, but the quantity of landings has, for example, increased nearly 120 percent in the commercial diving sector during the 4-

³⁰ Alternatively, the FDEP could have the right of first refusal on all reported sales (B. Palmer, MFC, personal communication). This procedure would allow the FDEP to purchase and retire, for example, those certificates reported sold at the minimum price. Such a program maybe difficult to implement in practice given the new owners would be required to forfeit their tags, however, it would reduce the incentive to underreport transfer prices.

year period from 1993-94 to 1997-98 (Hunt et al. 1998). Even though the non-trap commercial sector continues to account for a relatively small proportion of total landings, the number of non-trap gear harvesters and landings would be expected to increase as the total number of traps decreases and/or the cost of certificate ownership rises. An increase in non-trap commercial harvesters could increase conflicts with trap owners and reduce returns to certificate owners. Alternatively, the TCP could be restructured to allow multiple gear types. For example, by defining the use or quantity of non-trap gear relative to a trap, certificates could be allocated and traded in the same market. A discussion of the full details of this option is beyond the scope of this report.

Proposal 7. Restrict the total number of recreational harvesters or formally allocate the projected total landings between commercial and recreational harvesters in each season.

Rationale: Under current regulations, recreational spiny lobster harvesters cannot use traps but must possess a saltwater recreational fishing license and a \$2 crawfish stamp (Florida Statutes 370.0605 and 370.14(11), respectively). A recreational harvester is then subject to a daily bag limit that varies by time of the year and area of the state. A special recreational crawfish license is also available for \$100 that allows higher daily bag limits (Florida Statute 370.063). Recreational harvests have comprised from 12 to 24 percent of total spiny lobster landings during the early 1990s (Hunt et al. 1994, 1998). As with the non-trap sector of the commercial fishery, entry by recreational harvesters is essentially open to anyone. Since the implementation of the TCP, more than 110,000 recreational crawfish licenses have been sold annually (with the exception of 1995-96, during which the two-day sport season experienced inclement weather) (Hunt et al. 1998). As the population and the popularity of sport diving continues to grow in Florida, there is an increasing potential for conflicts between the recreational and commercial harvesters. These conflicts, along with increasing recreational harvests, could undermine the viability of the TCP. For example, average trap yields will not increase by reducing the number of traps – assuming a continued stable annual supply of lobsters – if recreational landings increase proportionately. As long as the recreational sector remains unrestricted, large increases in average trap yields, a stated goal of the fishery management plan, will not be realized.

Proposal 8. Develop and implement a mechanism to assess and collect an equitable rent per trap as stipulated in the legislation (Florida Statute 370.142(2)a.1).

Rationale: Reducing total fishing effort and improving the efficiency of commercial harvesting creates economic rents (surplus profits) in the fishery (Grafton). These rents can be allowed to accrue to certificate owners and become capitalized in the price of certificates, or the government can tax the rents. Rents that are capitalized into the price of certificates become a windfall gain to the original owners. While there are pros and

cons on the economic effects of taxing rents (Grafton; Johnson), there is nothing in the literature to suggest that the people of the State of Florida are not entitled to some return for the use of a public resource. In general, a tax on economic rents can be based on the market value of the certificates, the expected net returns to certificate owners, and expected changes in future harvests for the commercial sector (Clark, Major, and Mollett). The results of this report suggest that the reported transfer prices are not a reliable guide to the fair market value of these certificates. Consequently, some change in reporting requirements or penalties for misrepresenting transfer prices may be necessary before a rent mechanism can be developed. Alternatively, a different approach to measure the fair market value of certificates – such as the buy-out program described in Proposal 5 – could be used.

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APPENDICES

Appendix A: Account Balance by Fiscal Status, 1993-99

Fiscal Year	Fiscal Status Code & Description ^a	Number of Certificates			
		Type A-1	Type A-2	Type B	Total
1993	A: Active	689,094	2,910	32,228	724,232
1994	A*: Active, End-of-year	589,727	7,498	106,794	704,019
	B*: Billed, End-of-year	36,771	0	0	36,771
	T*: Error, End-of-year	5,988	0	0	5,988
1995	A*: Active, End-of-year	503,117	6,725	129,332	639,164
	B*: Billed, End-of-year	26,606	8	0	26,614
	T*: Error, End-of-year	24	0	0	24
	E*: Error, End-of-year	7,705	0	582	8,287
1996	A*: Active, End-of-year	427,545	9,229	146,221	582,985
	B*: Billed, End-of-year	16,949	146	588	17,683
	T*: Error, End-of-year	42	0	0	42
	E*: Error, End-of-year	5,955	0	14	5,969
1997	A*: Active, End-of-year	399,884	13,975	180,525	594,384
	B*: Billed, End-of-year	6,667	7	18	6,692
	T*: Error, End-of-year	4,895	0	2	4,897
1998	A*: Active, End-of-year	383,548	14,951	199,143	597,642
	B*: Billed, End-of-year	4,576	0	39	4,615
	T*: Error, End-of-year	2,653	0	10	2,663
1999	A: Active	353,871	13,943	165,006	532,820
	B: Billed	5,243	41	422	5,706
	T: Error	4,561	0	975	5,536

^a Asterisks represent end-of-year "close-out" balances. The difference in T and E "error" classifications is not known.

The vast majority of certificates are active. Since active certificates are those that have had their annual fee paid and have picked up their corresponding trap tags, this number represents the total number of traps that can be legally fished in a given year. Note that only in years 1994 through 1998 does the number of active certificates equal the end-of-year balance.

Appendix B: Alternative Measures of Participation, 1993-99

Fiscal Year	SPLs ^a	"C" Numbers ^b		Accounts	Individuals ^c
		N=22,807	N=21,005		
1992-93	3,673	3,742	3,698	3,711	3,696
1993-94	2,077	3,790	3,597	3,609	3,594
1994-95	1,467	3,609	3,523	3,535	3,521
1995-96	1,286	3,545	3,402	3,415	3,402
1996-97	1,403	3,534	2,394	3,431	2,399
1997-98	na	2,416	2,153	na	2,159
1998-99	na	2,155	2,152	na	2,158
TOTAL	4,136	3,948	3,878	3,903	3,896

^a The low number of SPLs in recent years is due to poor reporting. For example, in 1996-97, there were 2,023 missing observations and six SPLs were duplicated leaving 1,403 unique SPL numbers.

^b Of the total 22,895 observations, only 22,807 included the "C" number and only 21,005 contained positive certificate balances.

^c Calculated using the full name (last, first, middle initial, and title) of individuals with positive certificate balances.

The data set obtained from the FDEP containing information on the annual balance of each account had 22,895 observations. The number of observations was reduced to 21,005 by eliminating observations where the total number of certificates equaled zero.

The difference in the number of estimated participants from the various measures emphasizes the importance of identifying the source of the estimate. The number of SPLs is quite different from the number of crawfish endorsements – C numbers – or the number of accounts. The number of SPL is not a reliable indicator of the number of participants since some certificate holders may hold a special recreational lobster license instead. The number of accounts, however, differs only slightly from the number of C numbers and individuals. Note that by excluding C numbers associated with account containing zero certificates, the large decline in participants occurred prior to the start of the 1996-97 season (which is verified by the change in number of individuals), not prior to 1997-98. The difference between the number of accounts and number of individuals indicates the bias from individuals having multiple accounts (if the number of individuals exceeds the number of accounts) or sharing the same name (if the number of accounts exceeds the number of individuals). In either case the bias is small relative to the total number of participants.

