RECOMMENDATIONS OF THE SMELT WORKING GROUP

SUBMITTED TO RAY B. OWEN, COMMISSIONER
MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

NOVEMBER, 1996

Members:

Representative Paul Jacques, Chair
John Boland
Carroll T. Cutting
Gerald L. Damren
Glendon Johnson
Richard Jordan
Lt. Timothy Liscomb
Stan Milton
Dennis Smith
Stephen Staples
Glen B. Steeves

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INTRODUCTION

The Commissioner of the Department of Inland Fisheries called for the formation of a Smelt Working Group after several smelt rules proposed by the Department of Inland Fisheries and Wildlife in late 1995 received substantial public comment. The purpose of the Working Group was to discuss smelt management in Maine and to provide recommendations on the management of smelt to the Commissioner prior to the start of the 118th Maine Legislature.

To achieve that goal, an 11 member Smelt Working Group was formed comprised of one legislator, representatives of the Maine Department of Inland Fisheries and Wildlife, commercial and recreational smelt harvesters and others knowledgeable and interested in the issue. The Working Group held 5 meetings during the summer and fall of 1996. At those meetings, the group, which was chaired by Representative Paul Jacques, engaged in extensive and comprehensive discussions on a wide range of issues pertaining to the management of smelt.

The results of those meetings are listed below as a series of recommendations. Legislation is included in the appendices of this report for each recommendation that will require approval by the Legislature.

A. NON-STATUTORY RECOMMENDATIONS:

1. The Department of Inland Fisheries and Wildlife must be more aggressive in its smelt stocking and smelt egg stocking programs and must be willing to try new smelt management techniques;

2. The goal of the Department's smelt stocking and management programs must be to increase the of smelt waters and the number of smelts that are available as forage for game fish and for recreational and commercial harvesting by:

- supplementing existing smelt populations and increasing the number of ponds that support harvestable smelt populations. Fishery regional managers should re-open commercial or recreational smelt waters whenever feasible;

- Under appropriate supervision, using more volunteers to stock eggs;

- Encouraging wholesale bait dealers to donate smelt eggs for use in stocking operations. The Commissioner is encouraged to write to the bait dealers in the State and solicit their support in this voluntary program; and

- Through accurate and detailed records, tracking smelt populations and altering salmon stocking decisions accordingly;

3. The Department of Inland Fisheries and Wildlife, working in close cooperation with the members of this working group and other interested parties, should select an appropriate set of donor and recipient ponds and implement a controlled, multi-year experimental program to test the effectiveness of stocking live smelt.

4. A smelt management program can be successful only if recreational and commercial smelt harvesters, bait dealers, members of the Maine Warden Service, fisheries biologists, sportsmen and members of the public are included and are made to feel that they are each an important part of the program, from start to finish;

5. Everyone involved in the smelt stocking programs must work together in good faith and must share a commitment that smelt management programs in Maine must not fail. Sharing those

commitments is essential for the success of the program, particularly when addressing difficult issues such as the selection of donor ponds to test the live transfer of smelt;

6. The Department of Inland Fisheries and Wildlife, legislators and sportsmen must expect a range of public responses to short term fluctuations in smelt populations, but they must remain focused on the important long term goal of increasing the number of smelts and smelt waters in Maine;

7. The Department of Inland Fisheries and Wildlife and other participants in the program must maintain detailed records of every aspect of the program. Successful and informed management decisions in the future will depend on accurate and complete data at every stage of the process. Data collection strategies must be based on a belief that all data collected could be extremely valuable in future smelt management decisions, regardless of whether or not the importance of that data is recognized today; and

8. The Commissioner of Inland Fisheries and Wildlife should review the penalty structure applicable to violations of the smelt fishing laws and should make any necessary recommendations to the joint standing committee of the 118th Legislature having jurisdiction over inland fisheries and wildlife matters.

B. STATUTORY RECOMMENDATIONS *(SEE APPENDICES)*

1. The law should be amended to make it illegal for a person holding a live bait retailer's license or a person holding a smelt wholesaler's license to acquire live smelts from a person who is not licensed to deal in smelts. The penalty provisions for this violation must include monetary fines and must allow for the revocation of the bait dealer's license;

2. A minimum size limit for smelts taken for bait must be established. The Work Group recommends that a person taking smelts for bait during the winter months must, at the time they are harvesting the smelts, have in their immediate proximity and be using a #14 fish grader. Undersized smelts must be immediately liberated alive into the waters from which they were taken; and

3. The law should allow the use of pine boughs to mark the location of holes in the ice used in the harvesting of smelt.

C. SONAR EQUIPMENT

In addition to the above recommendations, the Working Group strongly and unanimously recommends that the Maine Outdoor Heritage Fund Board use funds available in the Maine Outdoor Heritage Trust Fund to purchase a scientific quality, hydro-accoustic sonar for use by the Department of Inland Fisheries and Wildlife as a fisheries management tool. As a voting member of that Board, the Commissioner of Fisheries and Wildlife is in a strong position to advocate for this extremely useful and cost-effective tool. It is the understanding of the Working Group that the cost of this sonar equipment, including the necessary personal computer hardware and software is around $29,000. It is also our understanding that this equipment will be on the list of items considered for funding by the Board at its meeting in January of 1997. A copy of the report of a field test of this equipment at Grand Lake is included in the appendices of this report.

Members of the Smelt Working Group

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Lt. Tim Liscomb	Bangor Headquarters Maine Warden Service 65 State Street Bangor, ME 04401	1-800-624-2498
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Glenn B. Steeves	109 Valley Road Raymond, ME 04071	

AN ACT to Implement the Recommendations of the Smelt Working Group

Be it enacted by the People of Maine as follows:

Sec. 1. 12 MRSA, section 7171, subsection 4, paragraph A, subparagraph (5) is enacted to read:

(5) A person holding a live bait retailer's license may obtain live smelts only from a person lawfully licensed under this section to deal in live smelts.

Sec. 2. 12 MRSA, section 7171, subsection 4, paragraph A, subparagraph (9) is amended to read:

(9) The holder of a smelt wholesaler's license who attempts to take live smelt for resale using drop nets from the inland waters of the State by fishing through the ice must mark all holes made in the ice by that person for that purpose. The holes must be marked either by fir boughs placed around the hole or by suspending at least one strand of fluorescent biodegradable tape at least 3 feet above the ice around the entire perimeter of the hole so that the tape is visible from all sides.

Sec. 3. 12 MRSA, section 7171, subsection 4, paragraph C, subparagraphs (10) and (11) are enacted to read:

(9) A person holding a smelt wholesaler's license may obtain live smelts only from a person lawfully licensed under this section to deal in live smelts.

(10) A person holding a smelt wholesaler's license must, at the time that person is engaged during the winter months in the taking of smelts, have a #14 fish grader in operable conditions in their immediate proximity during the taking of smelts and must use that grader during the smelt harvesting activity. The license holder must immediately liberate all undersized smelts alive into the waters from which they were taken. For the purpose of this subparagraph, a 314 grader is a grader having a maximum grate size of 14/64 inches.

STATEMENT OF FACT

This bill makes it illegal for a person holding a live bait retailer's license or a smelt wholesaler's license to acquire live smelts for resale from a person who is not licensed to deal in live smelts. The bill also requires a person holding a smelt wholesaler's license to have and use a #14 fish grader during wintertime while engaged in the taking of live smelts and to immediately liberate undersized smelts alive into the waters from which they were taken.

Maine Department of Inland Fisheries & Wildlife

Smelt Working Group

Minutes of Working Group Meetings

Commissioner Ray "Bucky" Owen, Jr., and Deputy Commissioner Matt Scott established a Freshwater Smelt Working Group to meet in mid-1996 to discuss smelt management and issues affecting future smelt management in Maine. Members were:

Representative Paul Jacques, Chairman
Rick Jordan, Fisheries Biologist, liaison
John Boland, Fisheries Biologist
Warden Lt. Tim Liscomb
Carroll Cutting, Advisory Council
Stan Milton, Advisory Council
Gerry Damren
Glenn Johnson
Dennis Smith
Steve Staples
Glenn Steeves

Minutes of May 28, 1996, meeting

Four meetings were held. At the first meeting on May 28, each member was introduced and gave a brief statement regarding their interest in smelts. Rick Jordan presented an overview of the Department's smelt management activities, including management goals, objectives, and priorities. Appendix 1 presents the above section of Maine's statewide species plan for rainbow smelts.

Since 1980, the Fisheries Division has introduced smelts via egg transfers to 48 new waters primarily for the purposes of establishing new populations for use by both sport and commercial smelt harvesters. About 20 of these introductions are known to have been successful, and others are expected to be successful after smelts have had time to become established.

There are at least 68 viable smelt runs being used for dipping in Maine. Although very few additional closures are anticipated in the future for biological reasons, there is a possibility of landowner-initiated requests for closures due to social conflicts.

The remainder of the first meeting was spent with members raising issues and asking questions about future smelt management in Maine. Brief discussions ensued on each topic, and Chairman Paul Jacques put each major issue on an agenda for a future meeting, to permit preparation for a thorough discussion on each topic. The following represent the proposed agenda for the next two meetings:

June 26 meeting agenda:

1. Discuss live smelt transfer versus transfer of smelt eggs. Discuss the problem of the parasite *Glugea* and the smelt virus that was found in New Brunswick.
2. Sources of smelts, geographic locations
3. Other available water bodies for smelt introductions
    a. social and biological
    b. closed versus opening

July 30 meeting agenda:

1. Warden Service involvement - Current laws
    a. Out of State shipping
    b. Size grades of smelt being caught and sold. Topic of a smelt grader law.
2. Alternating smelt water (tributaries) openings versus statewide closure
    a. Advantages
    b. Disadvantages
3. Summarize Working Group discussions and recommendations for final report
    a. draft review by committee
    b. any additional meetings necessary?

The May 28 meeting adjourned at about 12:45 p.m.

Minutes of June 26, 1996 Meeting

Rick Jordan briefed the Working Group regarding the Canadian smelt fish-kill and the unidentified virus that was isolated from that lake's population of smelts. Inland Fisheries and Wildlife's fish pathologist, Dave Tillinghast, feels that because Maine borders New Brunswick geographically, the Fisheries Division should begin to test Maine's smelts to determine whether they are carrying any fish diseases. Because we need ensure that the smelts Maine is using for transfers do not carry fish diseases, Maine's fishery biologists will collect smelt samples for fish health testing to be done by Dave Tillinghast.

There was a discussion recommending that the Department should do more new smelt introductions and more improvement of existing smelt populations into waters that are open to taking of smelts by hook-and-line and by dropnetting. The Working Group recommended that the Department be more aggressive in establishing new sources for both recreational and commercial smelt harvesters to make up for lost opportunities when waters have been closed to smelting.

The Group discussed the use of smelt eggs versus live smelts to accomplish introductions and improvements to existing smelt populations. Some members felt that only live smelts should be used to remove the uncertainty of how many smelts would be transferred when eggs are used. Some felt that adequate live smelts could be obtained by dropnetting to accomplish Maine's transfer needs. However, Rick Jordan and John Boland

explained that there are several factors that make egg transfers the only acceptable option. First, smelt eggs are routinely given a salt dip of the proper concentration for the proper time to kill any trace of the microsporidian parasite *Glugea*. If live smelts were used, nondetectable infestations of *Glugea* could be introduced into new waters, with harmful effects on smelt populations. There is no way to treat live smelts to remove *Glugea*. Second, the number of smelts that can be transferred via eggs is much greater than the number that could be obtained for transfer using live smelts, an important factor because the number of smelt transferred must be very large to be successful and beneficial. It is common to move 1/2 million smelt eggs per burlap bag used in a smelt egg transfer, and numerous bags can be used to increase the number stocked. Water temperatures are carefully tempered during egg transfers to assure no problems from thermal shock.

After a thorough discussion, the consensus of the Working Group was that smelt egg transfers are the best method to use, but that there should be 1 or 2 study ponds for live smelt introductions to determine how long it would take to create a good smelt population from this method. One should be a small pond and one should be a large lake. There should be no salmonid fisheries in either study water, and the study lakes should be closed to smelting for 2 years after the transfer to permit the population to get established before harvest begins.

Rick Jordan discussed that 25 lakes in Maine presently are used on a regular basis as smelt egg donor lakes. He distributed a map to show the geographic location of these lakes. Very few other smelt lakes meet the necessary criteria to be used as a smelt egg donor lake. Criteria are as follows:

-Access during early spring mud & snow conditions. Should be able to drive close to spawning brooks

-dependability of run being large enough

-disease and *Glugea* status. Some waters are no longer usable due to *heavy infestations of Glugea* (King, Keenes, Bryant Pd.).

- don't usually use eggs from a good LLS/LKT water due to management conflicts

- don't usually use runs open to dipping so we don't affect the quality of future runs there, and so they don't vandalize our burlaps.

-many smelt lakes have no stream-spawning occurring; it is all shore-spawning, so these eggs are difficult to locate and not concentrated enough to transfer.

-lack of a consistent annual run suitable for transfers

-lack of suitable smelt spawning streams. Smelts either spawn on shore or spawn in deep, wide tributaries, unsuitable for getting eggs on burlaps.

-freedom from vandalism of burlaps (vandalism has been a problem)

-no problems from landowner to going across his land to remove smelt eggs

If more good donor waters were available, we could use them. We are using the waters that are clearly the best, in order to augment existing smelt populations when they experience natural declines. No region has a surplus of donor waters. Region A only has one, and it has *Glugea*.

Rick also listed the criteria for waters being considered for new introductions of smelt, as follows:

1. If the water gets warm and there is a lot of competing species (white and yellow

perch, pickerel), we don't expect to be able to create a good dependable donor source from this kind of a lake.

2. If there is to be dipping allowed, there must be 1 or more suitable streams, without camps or potential landowner problems.

3. If no dipping is to be allowed, and fishery is to be Hook & Line or dropnet, criteria are less stringent.

4. Use a water where we will not eventually manage for a salmonid species and be tempted to close it to smelting later on.

Potential waters for smelt introductions for sport and commercial fishery purposes:

Region A: Watchic Pond, Standish
Adams Pond, South Bridgton
Great East Lake, Acton
Stanley Pond, Hiram
Trafton Pond, Hiram
Fosters Pond, Bridgton

Region B: Torsey Pond is continuing an ongoing introduction with no initial success yet. No other new waters available, but they will augment existing waters when populations decline. They recently accommodated an angler petition to open Great Moose Pond (Main Stream).

Region C: Large-scale smelt augmentation at Pocomoonshine Lake this year and potential to do this at Clifford Lake in future. Augment Hancock Pd., Orange Lake, Second Machias Lake.

Region D: tried Norcross Pond and Wesserunsett but were unsuccessful. No other good candidates available.

Region E: tried best candidate, Fitzgerald Pond, unsuccessfully. Unaware of a candidate water that could produce a viable smelt fishery, without interfering with trout management.

Region F: Have introduced smelts to Baskahegan Lake last 3-4 years and got some runs in brooks, but not on a consistent annual basis; introduction considered marginally successful. Very difficult to find any other suitable waters for new introductions to establish fisheries.

Region G: Ross Lake, Monticello-introduced 2 burlaps in 1996
Cochran and Bradbury Lake, New Limerick: candidate
Durepo Lake, LImestone
Carry Lake, Littleton (recent illegal introduction) - no dipping potential, but will open to Hook & Line if smelts show up

Waters that have been closed to smelting that could be re-opened:

Region A: None. All were closed for sound biological reasons.

Region B: opened Flying Pond, but not the tributaries this year. This had been closed due to SOCIAL problems. Heard no reports from this spring.

Region C: possibly 1. L. Oxbrook Lake.

Region D: would re-open just the lake itself at Clearwater Lake in Industry (Franklin

County) to dipping in the lake. Lake and tributaries were closed in 1996 due to social problems.

Region E: none
Region F: might find 1 or 2
Region G: none

The Working Group asked Rick Jordan to review the list of waters open to commercial smelt dealers under the 8 quart limit to pick the best possible candidate waters for improving existing smelt populations. Also, some of these waters may not have a smelt population, so these could be targeted for introductions. Finally, we should also consider whether there are some waters open only to taking 2 quarts of smelts daily where some improvement could be made to population levels. Rick will contact each regional biologist and report results at the next meeting.

The use of volunteers to assist in smelt egg collection and transfer was discussed as a way of gaining more manpower and of getting smelt eggs from more remote smelt runs with difficult access. Some bait dealers have been voluntarily cooperating with local biologists by permitting the biologists to put burlap bags in the dealer's tanks to collect additional eggs for transfer. One problem with this has been that fungus begins to grow on the eggs fairly quickly in the tanks. A second potential problem is that if any fish diseases become documented from Maine smelts, dealers would have smelts in their tanks from several different bodies of water, many of which had not been tested for their disease status. Due to the latter concern, it would be prudent to stock eggs from dealer's tanks into non-salmonid waters to attempt to minimize this risk. At the end of the discussion, it was suggested that the Department's volunteer coordinator, Charlie Mann, be asked to establish a pool of names of (1) those bait dealers who would voluntarily allow taking of eggs on burlaps from their smelt holding facilities in the spring, and (2) those anglers who would assist biologists in routine smelt egg collection and transfer. John Boland suggested that for any dealers who volunteer to permit collection of eggs from their tanks, a biologist should visit them early enough to view their facility and explain what needs to be done.

Rick Jordan suggested that Maine should initiate serious attempts to grow smelts in captivity to furnish a source of (1) eggs for transfer, (2) live bait reared in a hatchery situation, which would not pose the problems raised when overharvests occur in Maine's lakes. Although some attempts have made to grow smelts in captivity, problems have prevented success. Perhaps some Outdoor Heritage Fund money could be used for this project to be done at one of Maine's hatcheries, with results disseminated to the public.

Two additional suggestions were offered near the end of this meeting. Although it is now illegal for an unlicensed person to harvest and sell smelts, an important and beneficial change to the law would be to also make it illegal to BUY smelts from an unlicensed person. The final suggestion was from Glenn Steeves who recommends that we close the really small smelt spawning streams, but continue to allow dipping in the lake itself, such as with a lantern.

Meeting adjourned at about 12:30 p.m.

Minutes of July 30 Meeting

Rick reported to Working Group regarding their request at the last meeting that the Department should review the current 8-quart commercial smelt water list to determine where the Department can (1) introduce smelts, (2) increase smelt abundance, or (3) otherwise increase opportunity to take smelts. See Appendix 2 for details.

Glenn Steeves cautioned that we should not spend time and effort improving smelt populations on lakes where people cannot gain access.

Much of this meeting dealt with laws, rules and regulations, necessary changes, and Warden Service involvement in enforcing smelt laws, as well as enforceability of the laws. The Group agreed that there is a need and a desirability to make it illegal for any wholesaler or retailer to buy smelts from any unlicensed seller. Penalties need to be increased on certain violations of Maine's smelt laws, and convicted violators should not be permitted to sell from the same premises for a period of time, to prevent them from putting the license in a family member's name and continuing the business. Proper penalties are the most important deterrent factor.

Steve Staples and Glenn Steeves felt that the commercial smelt wholesaler license fee should be increased substantially for dropnetting and there should be one additional license for those who will only take smelts by hook and line. Paul Jacques said that the Legislature does not normally agree with fee increases designed to reduce the number of licensed dealers, especially if it is proposed by the commercial dealers themselves.

Export of Maine smelts to other states, especially New Hampshire was another topic of discussion. It was pointed out that states normally cannot regulate interstate commerce. Carroll Cutting saw no problem with out-of-state shipping of smelts as long as the dealers can meet Maine's needs for smelt as bait. John Boland reported that he spoke to biologists in New Hampshire. New Hampshire requires all bait dealers to report the number of smelts imported from Maine and the name of the source lake. In recent years New Hampshire dealers have reported importing about 200,000 individual smelts (16,700 dozen) from Maine. Glenn Steeves reported that he sold more than 2,000 dozen smelts to New Hampshire dealers last year; Steve Staples sold 1,500-2,000 dozen, and Gerry Damren sold 600 dozen. Glenn Steeves estimated that about 85% of smelts caught in Maine are sold in Maine.

Grading of smelts:

The dealers on the Working Group reported that a #14 grader, which has a spacing of 14/64" between the bars, will hold smelts about 3.5" long. A #13 (13/64") grader holds smelts about 3" long. Going the other direction to a widely spaced grader, a 15/64" or a 16/64" grader will let even a 4.5" smelt swim out of the grader, and thus is too big to use. Glenn Steeves grades all of his smelts on site when caught. In cold surface water temperatures in the winter, smelts do not grade well because both the water and the metal is so cold. Glenn described that you do not pick up or shake the grader; rather you give the smelts time to swim through on their own. He recommended that all grading be done while on the lake so small smelts went back in the water where they originated, but cautioned that the method of grading should be to let the smelts swim out passively, rather than lifting and shaking the grader. Steve Staples only grades his smelts at his shop, then stocks the small smelt back in the lake. The point was raised that, in terms of limits and when smelts are in

your possession, make sure that the law allows you the chance to grade the smelts, perhaps in a shack, which is warmer than out on the ice in the open air. Steve Staples remarked that shacks are not part of the commercial smelter's regular equipment anymore, unless the lake has enough smelts to stay there for a while. Rick commented that grading should be done on-site; it is technically illegal to grade smelts at your bait shop then re-stock the small grades unless you possess a stocking permit for this activity. Gerry Damren commented that grading is important in the winter, but that spawning smelts generally do not need to be graded because by the time they are large enough to spawn, they are large enough to use as bait. Warden Lt. Tim Liscomb discussed the problems with enforcing proper grader size and allowable size of smelts, as well as the need for each warden to have a commercially made size-certified grader to enforce the law, if grading is required. He felt that grading should be done by smelt wholesalers only. Discussion followed as to what percent tolerance would be allowed for small smelts, as is the case with clams and Department of Marine Resources permits a 10% tolerance of sublegal clams. Tim Liscomb raised the point that some bait dealers would be irate if wardens graded smelts at their place of business, and some would blame any smelt mortalities on the Wardens who handled their smelts. In response to a question as to whether retail dealers would need to grade smelts as well as smelt wholesalers, Paul Jacques responded that everybody should grade their smelts. He recommends giving the Department the rule-making authority to regulate smelt grader size, as well as whether or not it is necessary to grade. After some additional discussion and comments from Lt. Tim Liscomb, Paul suggested that perhaps we should say that every licensed smelt wholesaler (harvester) must grade his smelts while on the lake with a 14/64" grader, and let it go at that.

The final consensus of the Working Group was that we recommend that graders should be used in the wintertime only, on the lake. They would not be necessary in the spring due to the larger size of smelts taken on the spawning runs. The Group recommended that grading be accomplished by allowing the smelts to swim passively through the grader, rather than jostling the smelts and lifting the grader.

As the meeting drew to a close, Gerry Damren requested that every fisheries region try to come up with 5 waters to re-open to recreational smelting and dipping with a 2-quart limit. Rick spoke about the problems with this, because the waters which are closed were almost all closed for biological reasons, especially to maintain good forage levels for coldwater gamefish. Reopening them would be very risky and could adversely impact growth of important gamefish populations.

The final meeting will be Tuesday, August 27, at the Sidney Headquarters, from 10 a.m. to 2 p.m. Paul Jacques proposed that we have a working lunch so that we can conclude our business by 2 p.m., and he offered to bring the sandwich "fixings". Carroll Cutting will bring the soda, and Rick Jordan will bring lobster salad and crackers for the appetizer.

Agenda items will be as follows:

1. Ask Denny McNeish to explain why 3 Belgrade Lakes were close to smelting. If Denny is unable to attend, John Boland may explain, after consulting with Denny.

2. Alternate year openings versus statewide closure

3. Rick will bring list from earlier meeting of waters where increased smelting opportunity will be attempted.

4. Steve Staples suggested a discussion regarding predator levels (coldwater fish, warmwater fish, humans) and their impact on smelts.

5. Summarize our meetings, minutes. Final recommendations.

Meeting adjourned at 12:45 p.m.

Minutes of Smelt Working Group Meeting of 8/27/96

The Smelt Working Group met at 10 a.m. to discuss the following agenda:

1. Explanation from Region B as to why 3 Belgrade Lakes were closed to smelting.
2. Alternate year openings versus statewide closure
3. Rick will bring list from earlier meeting of waters where increased smelting opportunity will be attempted.
4. Steve Staples suggested a discussion regarding predator levels (coldwater fish, warmwater fish, humans) and their impact on smelts.
5. Summarize our meetings, minutes. Final recommendations.

Steve Staples mentioned that after reading the minutes of previous meetings he was not satisfied with the number of waters where smelt introductions and increased opportunity would be increased. He desired larger scale increases as a result of the Working Group meetings. Speaking specifically of Kennebec County, where he does much of his smelting, he mentioned that 22 of 88 lakes or ponds had smelt populations. He felt that of the 66 waters with no smelts now, probably 44 of them could be smelt transfer candidates, but he would especially like to see them introduced into about 30 waters, compared to Region B's proposed 4 waters. Steve feels that smelt dealers could move live smelts into several waters each night. Rick Jordan and John Boland commented that egg supply sources are the factor limiting how many places the Fishery Division staff can move smelt eggs, and their first priority must be to transfer eggs to waters with reduced smelt populations which are necessary for forage for coldwater gamefish. Further, they commented that unless fairly large numbers of smelts or smelt eggs are transferred when making introductions, people may have an unrealistic feeling that they accomplished a lot, when they may not have moved enough to make any meaningful difference. Gerry Damren agreed with Steve that more transfers are needed. Carroll Cutting noted that it will be important to use smelt eggs obtained from smelt dealer's tanks in the spring; rather than wasting those eggs, they would be useful. Paul Jacques commented that (1) there is no way that biologists can accomplish all of this alone, (2) it will be necessary to expand by using volunteers and many people want to help us, (3) we can't go as fast as Steve wants to go, but we can't go as slowly as has been done in the past, (4) many people want us to "do something", take a chance and try to find the happy medium, because fishing license sales have dropped and we may continue to drop if people have been failing to buy them due to dissatisfaction about fisheries the role that smelts play in fisheries successes and failures.

Steve suggested that the department recommend a water which has no *Glugea* and any fish diseases and let the dealers dropnet, then they would move the live smelts into many waters to either introduce them or increase their numbers. Steve felt that he could have adequate numbers of live smelts transferred into his 30 candidate waters in about 3 nights of dropnetting and transferring.

Carroll stated that he would like to have this working group continue to meet, to at least have an annual meeting to follow up on what has been done.

The question was asked about how would Steve get permission to transfer live smelts. Rick responded that since he desired to do something that was against Fishery Division

Policy, he would have to contact Peter Bourque for permission. Also, no waters could be stocked without a stocking permit from Peter.

Paul suggested that it might be good to take one county, perhaps Kennebec County, and take 22 or 30 of the waters that Steve wants, and give it a good try annually to see if this practice works or fails.

Gerry recommended that the Department should possibly reclaim a 50-100 acre pond, then use it solely as a live smelt donor water.

The final group consensus was to recommend that live smelts be tried in transfers in some selected waters in Regions A & B in the following manner:

1. Dropnet the receiving water to see if smelts are present and gather some information about their abundance.
2. Stock "x" gallons of live smelts, according to a consistent rate to use based on acreage, into each study water in Year 1.
3. Dropnet one year later to collect data.
4. If necessary, stock "x" gallons of smelts again in Year 2.
5. Continue follow-up and stocking until deciding that the program has been either a success or a failure.
6. Close to taking of smelts while trying to build up the population.

When questioned by the group about his views on this concept, John Boland said that he could pick about 6 waters, representing a broad array of scenarios, to use as study waters in his region. Paul cautioned that we not start out with a list that was too large and let things get too "crazy"; pick 6 waters from Region A and some from Region B and give them a good try.

When the group questioned Rick regarding his views, he remarked that, although this represents a departure from established policy, he would support doing it on a limited number of waters. Present policy requires only transfers of eggs, which can be salt-dipped to kill *Glugea*, but we have never known if we may be transferring a bacterial or viral fish disease, and we have done nothing to protect against this possibility. Therefore, if we can test one or more sources of live smelt through F&W fish pathologist Dave Tillinghast, and find no obvious *Glugea* or fish diseases, then we could consider giving annual permission to move these live fish into approved study waters, just as we do for other live fish species which test "disease-free". Rick said that to minimize the risk factor from diseases, he recommends that no waters with principal fisheries for trout and salmon be used as live-smelt study waters; rather put them in waters that would be managed for smelts as a fairly high priority.

Paul commented that we want this project to succeed, so let's do everything we can to do it properly. John proposed that he and Rick try to derive a proposed study "smelt stocking rate" to apply consistently to all study waters. Steve recommended that potential smelt donor waters to test for diseases come from the following list:

Long, Narrows, Basin, Tyler, and Salmon.

John had spoken to Denny McNeish and gave the following report regarding some of Region B's recent smelt closures. 1. Flying Pond was closed for social and political

pressures. 2. Great Pond was closed because it is being stocked with landlocked salmon, but if could be re-opened. 3. Messalonskee Lake is now open to smelting but has poor production. 4. Long Pond is closed due to its high-quality landlocked salmon fishery.

Bruce Steeves was in an accident recently and could not attend, but sent a letter with his thoughts and input (see attached). Regarding his suggestion of a state-certified measuring bucket marked to 8 quarts in 2-qt. intervals, the group discussed it but did not think it is a big enough problem now to do this, but will continue to monitor. Lt. Liscomb said that most individuals are not summonsed unless they are about a quart over the limit.

Regarding requiring dealers to grade smelts, Steve said that you need a shack or at least a windbreak to grade smelt in the winter. He would recommend a #14 grader and a 20% tolerance; let the smelts swim out rather than shaking them in the grader.

Lt. Liscomb said that the grader seems to be a good conservation measure, but it is not enforceable, unless the wardens observed on the lake and actually saw the dealer grade the smelts. Also, to determine whether the tolerance level has been exceeded, wardens would need to count all smelts, legals plus sublegals. This creates a lot of problems as there is some potential for some of the smelts to die from the handling associated with counting, creating bad feelings from the dealers towards the wardens.

In an attempt to solve some of the problems associated with grading, someone suggested that the law be written to say that "every wholesale smelt dealer must possess and use a #14 bar grader on the lake or pond on all smelts caught during the winter, and the grader must be used for a reasonable period of time to permit the small smelts to swim out". Paul commented that a grader law should most properly be done through the Legislature.

Steve Staples and Bruce Steeves have both commented on the bycatch of white and yellow perch they get in some waters while dropnetting. Steve commented that they must release these back into the lake, but many times the fish cannot swim away due to problems with air bladder after being lifted up from deeper water. Steve would prefer to dump them on the ice for eagles to feed on, but currently they must release all bycatch. The group recognized that there are a number of winter anglers who target white and/or yellow perch and they would be angry if they saw smelt dealers throwing them on the ice. The consensus was that if dropnetters release all species other than smelts back into the lake, even if the hole were located a short distance away from their netting hole, there should be no legal problem.

Gerry had wanted to discuss alternate-year closures compared to permanent closures of smelting because he saw what was happening at Salmon Lake, and he saw a desirability of closing the fishery for 3 years. However, he has now changed his mind on this, after observing that once the fishing gets very slow, fishermen quit going there, so the situation seems to regulate itself. Some in the group had remarked that a lot of effort is attracted during the years a lake is open to smelting, because anglers have an expectation of excellent fishing after the lake has been closed for a period of time. The comment was made that if there are enough waters open and left open annually, there should be few problems. This discussion did not attempt to open any waters to smelting if they had been closed for protection of forage for coldwater gamefish.

Bruce's letter commented on the new law requiring that a biodegradable fluorescent tape be used to mark winter smelting holes. Bruce and Steve recommend marking holes with green boughs. Paul does not think the Legislature will be willing to change this until it has been tried long enough to see if it works.

Paul asked Lt. Liscomb to check out the language on not burying smelts from unlicensed smelt dealers. Penalties for smelt harvesting violations should be increased, licenses should be revoked, and (unless unconstitutional) the dealer's premises should not be legal to be used for smelt sales by another person, if the owner has lost his license.

Glenn Steeves letter had asked us to review closure of spring smelting in tributaries 8' wide or narrower for 50' on each side of the shore at the mouth of the brook. The consensus of the group was that we already have many waters closed and we do not want to consider this type of a change.

Paul asked John and Rick to make some joint recommendations regarding the protocol for the live smelt transfer study and whether there is any way to adequately protect smelts in 100-acre ponds from overharvest of smelts with winter use under current regulations.

Just as landlocked salmon must forage heavily on smelts to achieve good growth, the Smelt Working Group recognized the importance of foraging heavily at noontime on the delicious lunch provided by Paul Jacques, devouring sandwiches and all the fixings like a school of starving piranhas. Thanks Paul!

Meeting adjourned at 2:20 p.m. Next meeting date has been changed from September 19 to October 17 at 10 a.m. at the Sidney F&W Office.

Minutes of October 17, 1996 Meeting

Meeting began at 10:00 a.m. with all members in attendance. Pat Norton attended to take notes and recommendations that he will use to prepare a final report from this Task Force which will benefit legislators as they consider the few statutory changes that have been recommended.

Address: Pat Norton
OPLA
State House Station 13
Augusta, ME 04333

287-1670, fax 287-1275

The group proposed the following recommendations:

1. Support the Fishery Division's priorities for management of freshwater smelt, with the #1 priority being to manage smelts for forage for coldwater sportfish species, #2 priority to manage smelts as sportfish with their own fisheries, #3 priority to manage smelts for commercial fisheries as a baitfish.
2. The Fish and Wildlife Department should more aggressively stock smelt eggs both in new waters and in waters with existing populations of smelts to supplement abundance in order to create more smelt harvesting opportunities and to improve forage for sportfish.
3. The Fish and Wildlife Department should solicit and use more volunteers in transferring smelt eggs and smelts. A letter should be sent to each licensed smelt wholesaler to request assistance in making smelt eggs from their holding facilities available to the Department for transfer. Also, volunteers should be solicited to assist biologists in collection of eggs from donor waters and in transfer into other waters.
4. The Fish and Wildlife Department should institute a cooperative study between commercial smelt dealers and fishery biologists to determine success of live smelt introductions using live smelts into selected waters in Regions A and B. All live smelts used in the study must come from waters certified to be disease-free by the Department's fish pathologist.
5. The Fish and Wildlife Department should obtain, using the Outdoor Heritage Fund, a scientific-quality sonar unit suitable for use in obtaining estimates of freshwater smelt abundance in Maine waters.
6. Enact the following statutory changes:

(a) It shall be illegal for any person to purchase live smelts from an unlicensed dealer,

(b) During the period from December 1 to March 31, each holder of a smelt wholesaler's license must possess and use a 14/64" bar grader at all waters where they harvest smelts. During grading, small smelts will be released on-site into the water from which they came. (Note: The purpose of this change is to require size-grading of smelts caught in the winter to prevent keeping of small smelts which are

not popular as bait.)

7. Ask Legislature to review recently enacted law requiring marking of holes in ice used for harvesting smelts to permit use of evergreen boughs instead of biodegradable plastic flagging, which becomes brittle and disintegrates soon after it is used during winter weather conditions.

8. The members of this Task Force should meet annually to discuss the progress of smelt management and transfers.

John Boland discussed the methods to be used in the live smelt transfer study. Paul Jacques stressed the importance of keeping accurate records of everything done during this study. John will arrange a meeting between dealers and biologists to plan and schedule the work for the live smelt transfer and evaluation project.

Rick Jordan discussed the need to locate an additional supply of reasonably priced burlap to use in smelt egg collection and transfer. Paul Jacques recommended that V. Paul Reynolds prepare a news release to determine if farmers or others in Maine may have a supply that they no longer have a use for and would be willing to donate or sell.

Paul Jacques concluded the meeting by strongly encouraging the Department to utilize a broad spectrum of participants (biologists, wardens, bait dealers, anglers, campowners, etc.) in future smelt work so that everyone has an interest, a stake, a responsibility, and something to lose. Paul and the Task Force members are committed that this work cannot fail. This Task Force has focussed on the major directions for smelt management to proceed, and they are optimistic that results will benefit all users of smelts in Maine.

The meeting concluded at 12:20 p.m.

Appendix 1:

Maine Rainbow Smelt Species Plan

PAST MANAGEMENT GOALS AND ACCOMPLISHMENTS

The long-range goal for smelt established in the previous plan (1986) was "to increase smelt abundance and availability and maintain at levels sufficient to sustain competing uses (1) as a forage fish for predator sportfish, (2) as a sportfish in its own right, and (3) as a commercial baitfish."

Specific objectives for the 1986 plan were as follows:

1. Maintain smelt populations in 468 Maine lakes totalling 696,716 acres.
2. Increase distribution of smelts into 25 new waters by 1995.
3. Maintain adequate populations of smelts as forage fish to maintain satisfactory growth rates of predator sportfish.
4. Increase the number of populations of smelts as a sportfish species to address demand for recreational hook-and-line and spring dipnetting fisheries.
5. Increase the number of smelt waters and maintain adequate populations for use as a commercial baitfish to allow harvest by hook and line, spring dip-netting, and other legal methods utilized by commercial smelt dealers under allowable legal limits.

By 1995, smelt populations existed in 554 Maine lakes totalling 739,834 acres, representing an increase of 86 lakes (16%) and 43,118 acres (6%) since 1985. During the period 1985-95 Fisheries Division staff introduced smelt into 23 new waters via egg transfers. The additional 86-lake increase in reported smelt occurrence resulted from a combination of newly established populations plus new knowledge and better accounting of previously existing smelt populations.

The first priority of the abundance objective in the previous smelt plan was to maintain smelt populations in 468 Maine lakes. This objective was fully met and exceeded. Because of wide natural fluctuations in smelt abundance, considerable management activity was directed toward maintenance and enhancement of smelt abundance. Accomplishments in terms of transplanting smelt eggs to augment existing populations have been very ambitious, primarily because of initiatives by regional biologists in identifying problems with salmonid growth. From 1985-1995, 187 smelt egg transfers were made into more than 100 lakes to fully accomplish this objective. More than 18% of Maine's smelt waters received egg transfers during this planning period. Transfers were made in numerous waters having existing, but depressed, smelt populations in an attempt to augment smelt abundance and improve salmonid growth. This procedure has yielded a high level of success in improving smelt abundance in eastern Maine's fishery Region C, when large numbers of smelt eggs are transferred. On a statewide basis, most transfers were done for the primary purpose of providing or improving forage for coldwater sportfish, with other transfers the purposes of providing

smelt sport fishing or sources of bait for commercial dealers. The number of transfers and their purposes were as follows:

106 - forage for landlocked salmon
71 - forage for lake trout
27 - forage for brown trout
17 - forage for brook trout
1 - forage for splake
74 - forage for multiple species of coldwater sportfish
57 - establish/augment sport fisheries for smelt
33 - establish/augment commercial bait fisheries for smelt
24 - multiple purposes of both forage and fisheries.

An update of the Maine's statewide lake inventory in 1993 revealed that there are 236 lakes (43% of Maine's smelt waters) supporting principal fisheries for landlocked salmon and lake trout where smelt are the important forage species in maintaining growth of these coldwater sportfish, versus 219 lakes accounted for in the 1980 inventory and 226 lakes in the 1986 inventory. Part of this increase is attributable to better accounting and partly to some new introductions. In addition, there are 101 lakes where brown trout, as the sole salmonid species, are supported by smelt forage, compared to 62 in 1986. Although brown trout forage on a wider variety of food items than landlocked salmon, the growth of brown trout greatly improves in the presence of abundant populations of smelts, especially if brown trout exist with numerous competing fish species. In summary, in 61% of the lakes and ponds where smelt occur in Maine, they are a vitally important forage species for landlocked salmon, lake trout, and brown trout.

The second priority of the abundance objective of introducing smelt into 25 new waters between 1985 and 1995 fell short by 2 waters, representing an achievement of 92% of the objective. Reasons for the shortfall include: transfers for forage improvement received higher priority, suitable candidate waters for new introductions were limited in number, and shortages existed in suitable smelt egg donor populations. Complete evaluation of the success of new smelt introductions will be possible only after new populations have reached adequate abundance to permit detection through various sampling methods.

Management during the last 10 years has fully achieved the objective of maintaining adequate populations of smelt as a forage fish to maintain satisfactory growth rates of predator sportfish through numerous transfers discussed above. Because abundant populations of smelts are vital to growth and fishing quality of Maine's highly utilized coldwater sportfish, this objective will continue to be the highest priority of smelt management activities in Maine. Regulations necessary to maintain smelt populations at adequate levels for forage may reduce fishing opportunity for sport and commercial interests, both lower priorities.

During the period 1985-95, fisheries management has introduced smelt into 16 additional waters for the purpose of establishing new recreational hook-and-line and spring dipnetting fisheries. According to s survey of Maine's seven fishery regions, viable and significant hook-and-line fisheries for smelt now exist in at least 57 lakes.

Due to the cyclic nature of smelt populations, the number of lakes having viable hook-and-line fisheries fluctuates annually due to the status of smelt populations in the individual lakes. The total number of smelt waters available statewide for sport fisheries has declined, however, due to enactment of new regulations which restrict harvest where necessary to maintain adequate smelt abundance for forage purposes. Normally hook-and-line fisheries are not restricted because smelts are taken one at a time, and the success of these fisheries is usually directly related to the level of smelt abundance. Restrictions occur more commonly on dipping of smelt, due to the higher likelihood of adverse impact from overharvest when smelts are concentrated on spawning runs and the possibility of adverse impact on the eggs from siltation or crushing if dippers stand in the brooks.

In 1984 a total of 10 waters was totally closed to taking smelt, and 47 were regulated to allow only hook-and-line smelt fishing during the openwater season. By 1996, the openwater angling lawbook listed 21 waters as closed to the taking of smelt, 89 waters where smelt could be taken only by hook-and-line, and 91 waters where the tributaries were closed to the taking of smelt. The large increase in closures of tributaries has resulted from regulations necessary to maintain smelt abundance for forage for sportfish, as well as to protect landowners from littering, noise, and property destruction problems sometimes associated with smelt fishing. Providing sport fisheries for smelt will continue to be the second priority of smelt management in Maine.

In 1995, smelt dipping was permitted in 231 (53.1%) of 435 known smelt runs in Maine.

Smelt were introduced into 10 new waters during the 1985-1995 planning period for the purpose of increasing the number of smelt waters available for commercial baitfish harvest. However, existing commercial fisheries experienced similar loss of opportunity to that reported above for sport fisheries as new regulations were enacted which restricted harvest, especially by the closure of lake tributaries. Management to permit commercial harvest of smelt as baitfish will continue to be a lower priority than management for forage and sport fishery purposes.

Appendix 2:

Summary: There are about 18-20 waters, mostly from the 8-qt smelting list, identified by the regions where improvements of the smelt populations could be attempted during the next 1-5 years, keeping in mind that the biggest limitation will be availability of smelt eggs. This would represent improvement in about 10% of the waters on the list IF all of them could be done successfully. One interesting suggestion from one region was to open more current smelt waters to night hook & line smelt fishing during the winter; this would increase opportunity quite noticeably. Following is a synopsis of input from the fishery regions.

Region A: 5 waters on the current 8-qt. smelting list have low or non-existent smelt populations where smelt eggs could be introduced, starting in 1997 **IF** they are available:

Ingalls (Fosters) Pond
Trickey Pond
McWain Pond
Island Pond
L. Moose Pond

2 other waters are not on the commercial smelting list, but commercial smelt harvest could be allowed:

L. Clemons Pond (would need smelt introduction)
Long Pond - Denmark

Region B: They will attempt to improve smelt populations where they expect some chance of success in the following 4 waters from 1995-1999:

They will do 3 waters/year and 3 years of smelt eggs/water at:
Torsey Pond 1995-97
Tilton Pond 1997-99
Woodbury Pond 1997-99
Wilson Pond 1997-99.

In addition, they will attempt to increase smelting opportunity by opening many of the 63 waters on the 8-qt. list to night-time hook & line fishing for smelts. In addition, 5 waters could be opened to night-time hook & line smelt fishing under the 2-qt. limit:

China Lake
Alford Lake
Messalonskee Lake
Great Moose Pond
Damariscotta Lake.

Region C:

Waters from the 8-qt. smelting list which could be improved, as eggs are available after highest priority transfers for salmonid forage are met annually:

Alamoosook Lake
Great Pond (Great Pond Twp.)

Lower and Middle Lead Mt. Pds.
Upper Patten Pond
Williams Pond
Pennamaquan Lake

Waters not on the 8-qt. list that could be improved:

Pocomoonshine Lake - started in 1996
Third Machias Lake - started in 1996
Clifford Lake
Orange Lake

Region D:

Of 26 waters on the 8-qt. smelting list, 20 have principal fisheries for brook trout, which cannot be jeopardized by increasing smelt abundance. 2 others are limited by water quality (High temperatures and low dissolved oxygen). The remaining 4 waters have quite good smelt runs, and splake are being introduce to 2 of them, so they do not want to encourage additional commercial harvest there at this time.

Region E:

If they have the time and the eggs, **after** accomplishing a massive transfer program at Moosehead, they could consider transfers to 3 waters, but the 3 waters have been tried unsuccessfully in the past, due to limitations on habitat as well as problems from predation and competition. In marginal waters like these 3 and other similar waters, the chance for success is low.

Region G:

This region has decent smelt waters on the 8-qt. list, but they are underutilized due to **access**, rather than due to lack of smelts. Generally, smelt dealers in this region haven't made enough effort to determine if the lake's smelt population is viable enough to support a commercial fishery.

From their discussions with smelt dealers, it appears that the most preferable waters to commercially fish are those with a good volume of deep water to fish over; only one water (Conroy Lake) meets this criteria, and it is the only water in Region G being commercially dropnetted now. Two other waters (Portland Lake in Bridgewater and Third Sly Brook Lake) formerly were on the 8-qt list, but were removed through a public input process.

A new introduction was started in 1996 at Ross Lake in Littleton, and will be added to the commercial smelting list in the future if smelts are successfully established. This lake has a good volume of deep water. The lake is closed to ice fishing and there is not now any summer public access, but there are a few tributaries that could be dipped depending on access.

Carry Lake in Littleton has had a recent illegal introduction of smelts. It is a small trout pond with a volume of deep water, and will be added to the list IF smelt reproduction successfully sustains a population there. There are no tributaries to the

lake, and it is closed to winter angling, but it could provide open-water hook & line smelt fishing.

Neither of the above waters are remote to pose back-country access problems.

Two lakes received smelt egg transfers this spring to improve smelt populations where there are popular fisheries. They are Conroy Lake and Little Machias Lake.

Aquacoustics, Inc.
816-C Brawley School Road
Mooresville, NC 28115
(704) 664-7737 Office
(704) 662-3685 FAX

October 2, 1996

Rick Jordan
Assistant Regional Fishery Biologist
Maine Department of Inland Fisheries and Wildlife
68 Water Street
Machias, Maine 04654-1022

Rick,

I processed the data we collected at night on West Grand Lake and selected some of the day samples from September 16 for comparing to the smelt densities at night. The following tables will give you an idea of the information I gathered with the hydroacoustics equipment. The mean size of the fish sampled at night was -53.05 dB, this corresponds to a length of 64 mm (converted using Love's any aspect acoustic size to fish length regression equation). I will send you a length distribution table when Biosonics provides updated software later this month. Table 1 provides the verticle distribution of fish in the water column for day and night sampling. Table 2 provides the distribution data I used to construct the map of smelt densities in West Grand Lake for day and night by location. The location information is written to file with the fishery data through GPS. I did not process all of the day samples because I do not have time, and our primary reason for sampling was to determine whether we could locate togue. I cannot separate the togue from whitefish and other species at similar depths, but with the species composition and size distribution information you gathered I think the hydroacoustics could provide total densites for larger fish and densities for smelt (assuming these are the primary fish in the lake 3 to 6 inches, total length). The map depicts the location for some of the day and all of the night sampling we conducted, and the smelt densities (number/hectare). When conducting a lakewide survey I take this information one more step and provide a scaled density distribution map by using ArcView GIS to plot the information. The map of Lake Norman, North Carolina is an example of the product. It appears as though sampling at night will be necessary to effectively estimate smelt population size. Although the mean densities are similar for day and night sampling, the schools are scattered during daytime and the estimates have very wide confidence limits. The echograms I am including show the schooling behavior during daylight, and scattering of the schools at night. This scattering results in better confidence limits because the variation in fish densities is not as great as during daylight when the fish are schooled.

It appears as though smelt would be an easy fish species to enumerate with hydroacoustics, and studies on Lake Oahe, South Dakota, Lake Michigan, and New Hampshire have been conducted on smelt. I would recommend sampling at night, although this is less appealing than daytime sampling due to the difficulting in navigating if other lakes in Maine have topography similar to West Grand. Late summer or early fall sampling should provide the population size after young-of-year recruitment has occurred.

If you have additional questions please call or contact me. Thank you.

Sincerely,

Don Degan

Don Degan

Table 1. Smelt density (number/hectare) by depth strata for day and night samples collected by hydroacoustics on September16, 1996 in West Grand Lake, Maine.

Depth Strata (m)		Density (number/hectare)	
Top	Bottom	Day	Night
1	2	0	284
2	3	0	267
3	4	0	413
4	5	0	434
5	6	5	375
6	7	0	477
7	8	7	343
8	9	6	394
9	10	2	344
10	11	18	478
11	12	35	176
12	13	99	160
13	14	47	149
14	15	1341	58
15	16	2805	20
16	17	3036	17
17	18	197	18
18	19	19	20
19	20	5	363
20	21	6	20
21	22	1	143
22	23	2	110
23	24	0	25
24	25	120	8
25	26	0	1
26	27	0	1
27	28	0	0
28	29	0	0
29	30	0	0

Table 2. Smelt densities by geographic location (longitude and latitude degrees) for day and night samples collected by hydroacoustics on September16, 1996 in West Grand Lake, Maine.

Day samples			Night samples		
Longitude	Latitude	Density (no/ha)	Longitude	Latitude	Density (no/ha)
67.83660	45.24765	0	67.81270	45.21323	777
67.83215	45.24973	0	67.82288	45.21965	85
67.83407	45.24902	1,619	67.82178	45.21895	385
67.85732	45.23977	548	67.82072	45.21848	87
67.83965	45.24575	0	67.82007	45.21805	273
67.84177	45.24490	0	67.81890	45.21715	127
67.84357	45.24425	0	67.81742	45.21625	388
67.84568	45.24328	0	67.81627	45.21548	392
67.84817	45.24200	0	67.81503	45.21465	762
67.85042	45.24090	45	67.81380	45.21382	565
67.85238	45.23952	7	67.80397	45.21003	468
67.85483	45.23982	14,887	67.81143	45.21263	964
67.86038	45.23910	0	67.81010	45.21177	1,089
67.85867	45.23942	0	67.80847	45.21168	1,421
67.87387	45.24347	1	67.80707	45.21105	2,502
67.86552	45.23908	2	67.80560	45.21038	2,024
67.86860	45.24040	0	67.80202	45.20942	495
67.87213	45.24170	62	67.80295	45.20982	766
67.87245	45.24805	806			
67.87295	45.24507	17			
67.87235	45.24673	0			
67.86110	45.24223	203			
67.87017	45.24558	0			
67.87113	45.24567	0			
67.87075	45.24670	73			
67.87018	45.24592	190			
67.86995	45.24472	22			
67.86823	45.24398	0			
67.86597	45.24313	0			
67.86345	45.24227	0			
67.83515	45.23623	0			
67.85875	45.24165	0			
67.85572	45.24122	0			
67.85348	45.24010	0			
67.85065	45.23965	9			
67.84767	45.23942	547			
67.84477	45.23928	0			
67.84298	45.23818	0			
67.83990	45.23787	1			
67.83732	45.23702	15,274			

Figure 1. Map of West Grand Lake, Maine with smelt densities (number/hectare) plotted by location for day and night samples on September 16, 1996.

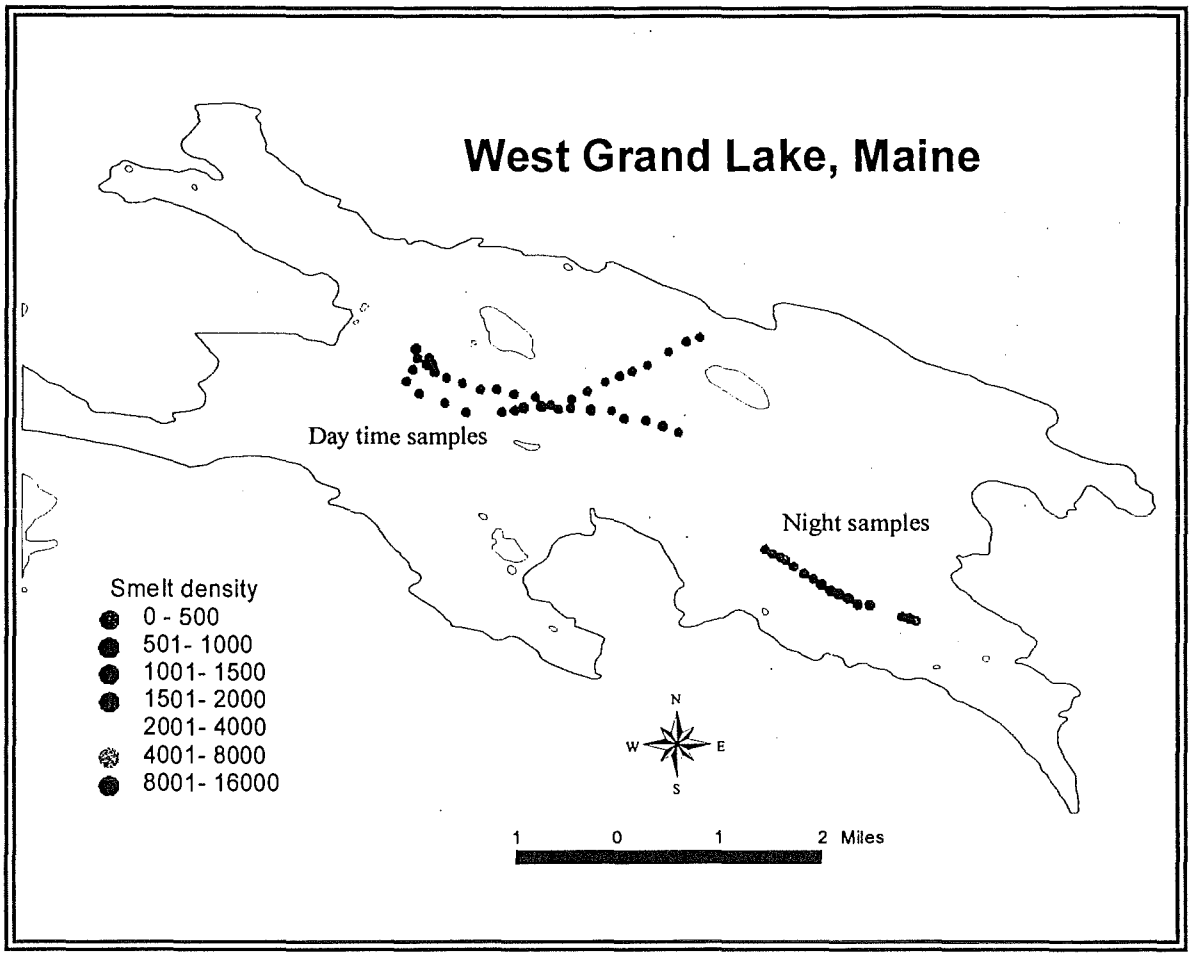


Figure 2. ESRI homepage description of use of hydroacoustics and GIS.

Figure 3. Echogram of schools of smelt during day sampling.

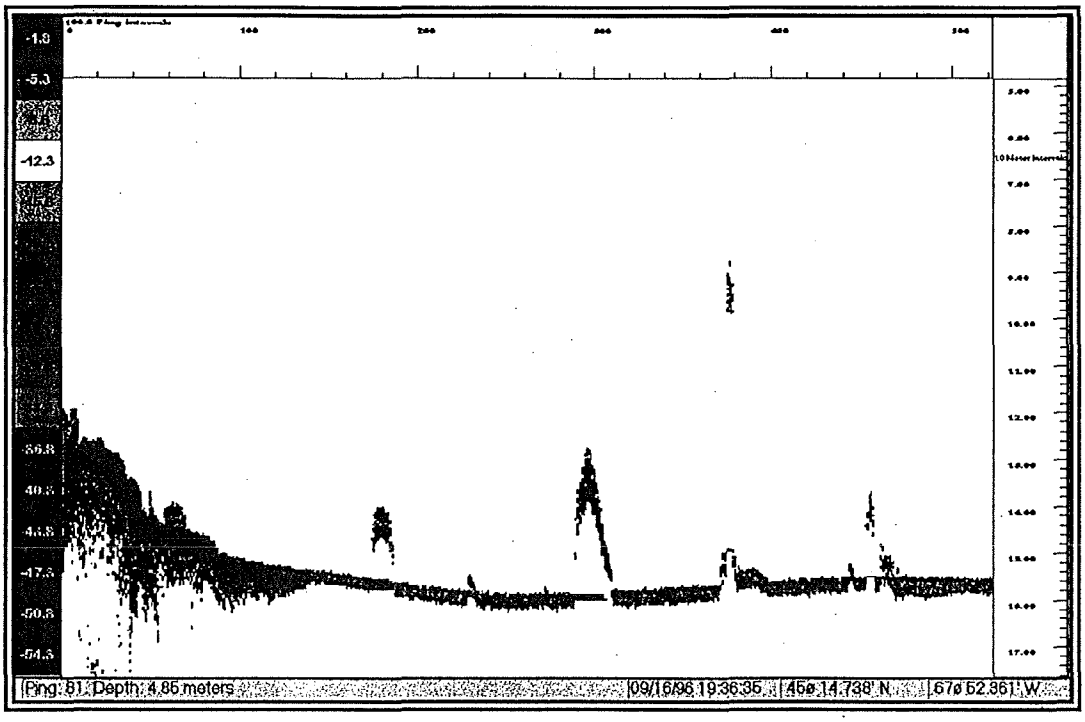
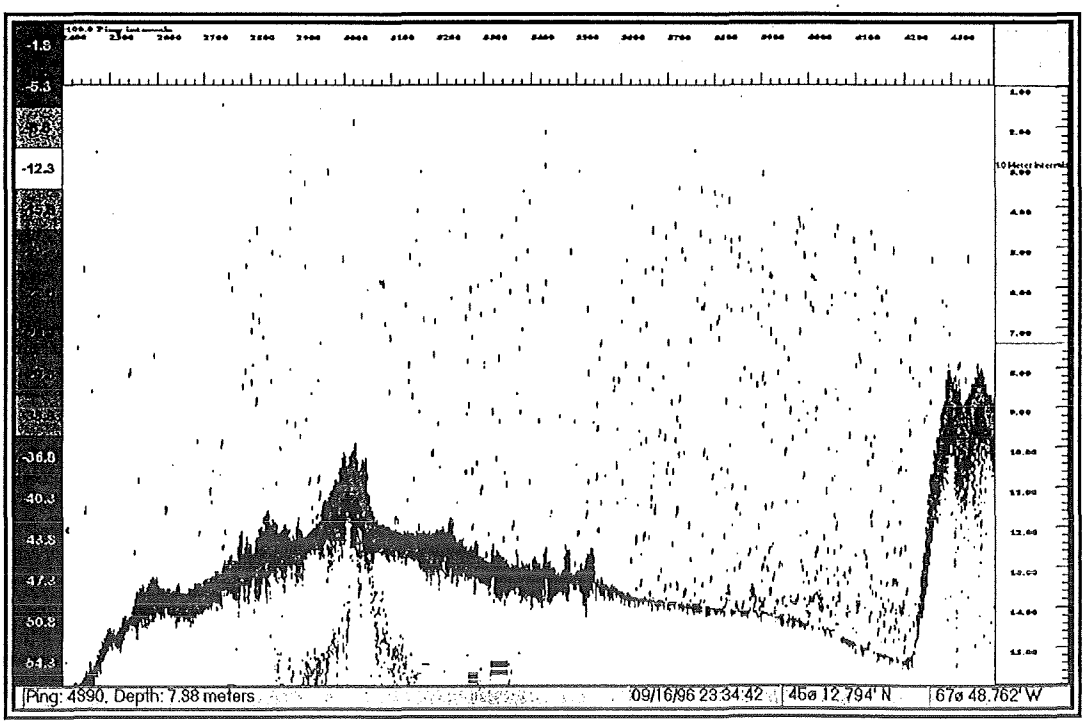


Figure 4. Echogram of smelt during night sampling.



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