DRAFT

OBSERVER PROGRAM

FOR SAMPLING OF

CENTRAL BERING SEA POLLOCK FISHERIES

This Compilation Contains:

A. Suggested Standards for Observer Training and Certification, and
B. Observer Program Manual drafted in December 1992

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July 1994

A. Suggested Standards for Observer Training and Certification

CENTRAL BERING SEA OBSERVER PROGRAM

Standards for Observer Certification
Elements of Observer Training

Prepared by:
Alaska Fisheries Science Center
North Pacific Groundfish Observer Program

The documents cited above are submitted for review and discussion by experts representing parties of the Central Bering Sea Observer Program. The documents form a basis upon which to build these critical portions of an observer program, and to provide for consistency between programs of participant nations. The information contained herein is provisional.

A draft observer manual was distributed and agreed upon in 1992. This manual can be edited to reflect any changes in sampling protocols or data forms decided upon during group discussions.

CENTRAL BERING SEA OBSERVER PROGRAM

STANDARDS FOR OBSERVER CERTIFICATION

Standards for observer certification can be applied in three arenas: (1) selection criteria to decide on who will participate in training, (2) minimum standards to maintain during training to determine who will receive certification, and (3) performance standards to maintain certification. A comprehensive observer certification process might be:

I. Choose candidate based on selection criteria.
   A. List of priorities within each criteria.
   B. Establish weighted criteria and minimum standards.
II. Candidate participates in training.
   A. Means of evaluating candidates during training utilized (exercises, quizzes, lab practicals, exams).
   B. Assistance provided where needed.
   C. Minimum standards established for each evaluation.
      1. Candidate given specified number of chances or amount of time to meet these standards.
      2. If not met, candidate dismissed, not certified.
      3. If standards met, candidate certified.
III. Certified observer deployed to fishery.
   A. Upon return, data reviewed during debriefing, corrected, and evaluated.
      1. If data meet minimum quality and quantity standards, observer retains certification.
         a. Observer must recertify if time-lapse between deployments too long.
         b. Observer maintains certification by participating in briefing sessions prior to each cruise.
      2. If data do not meet minimum standards, program managers must decide whether to revoke certification and:
         a. allow observer to retrain, or
         b. permanently decertify.
IV. Observer conduct.
   A. Conduct during training.
   B. Conduct while deployed to vessel.
   C. Decertification process.

Selection Criteria

Criteria used to assess an applicants suitability include:

- Education; level attained and primary course of study.
- Experience; relevant to the fishery, general experience at sea, biological field sampling experience, and other applicable work.
- Skills and abilities.
- References.

Ideally, observers deployed to the central Bering Sea pollock fishery will have finished a four-year degree (or higher standing) in fisheries or wildlife biology and have at-sea experience monitoring groundfish trawl fishing operations, with excellent references on their work-performance evaluations. There may, however, be few if any such observers available. Each program will need to determine what level of criteria will be used to select candidates for training. To achieve the goal of program compatibility and consistency among observers, the nations may want to establish some minimum standards. A provisional list of selection criteria is provided as attachment 1.

Standards for Observer Training

Observers arrive in training with a wide variety of experience and qualifications. Because of this disparity, a means of evaluating their understanding must be employed. Trainees experiencing difficulty with some of the material can be given special assistance. Successful completion of the training course will ensure that all observers are capable of completing their at-sea duties and collecting accurate and reliable data.

There may be instances in which the trainee simply cannot comprehend the sampling regime, cannot do the math required to complete their duties, or is unwilling to do the work required to gain an understanding of the tasks. The trainer must then make the difficult decision of asking the candidate to withdraw from training and withhold certification. These measures are important if programs are to achieve consistency between observers and compatibility of the data collected through separate programs.

To aid the trainers in making these decisions, and to establish a minimum quality standard for certification, the types of training

evaluations and the level of competence for each should be established. Following are some suggestions.

Math test.

- Delivered early in the training session, or as part of the selection process.
- Tests on math abilities directly related to sampling, data computations, and data extrapolations.
- Identifies those observers which may need extra assistance, in one or more areas.
- Mistakes identified and candidate's weaknesses corrected.
- Retest administered using different problems but testing same skills.
- If fails to achieve a certain percent correct by the third (suggested) retest, the candidate cannot continue in the training course.

Class exercises on sampling techniques and filling out forms properly.

- One exercise (at least) given for each form, and another large exercise which ties all forms together administered.
- Instructions and text provided which describe data elements, the trainee fills out example forms from these descriptions.
- Active participation in mock sampling.
- Exercises can be administered several times, until the trainee is able to fill out the form correctly or until it is obvious the candidate should not receive certification.
- Development of exercises can begin upon finalization of data forms and observer duties.

Species Identification test.

- Preceded by identification lectures and labs using slides and pickled and fresh or frozen specimens.
- One retest is suggested.
- Possibilities include designating some species the trainee must identify correctly, and others in which the trainee must attain a certain percent correct.
- Candidates to be able to use identification materials they would have at sea.

Quizzes - verbal and written.

- Administered at appropriate times during training.
- Can either be given retest chances, or must attain a certain overall percent correct.

Final Exam

- A final test which incorporates all aspects of training.
- Candidates should attain a certain percent correct to be certified.

Performance Standards to Maintain Certification

Performance standards include how well observers carry out their duties, and what their conduct is during their tour of duty. These are two separate issues. Regarding conduct, each program should decide on what their standards will be, with a group of experts convened to discuss some program-wide minimum standards. In general, observers are expected to conduct themselves in a manner which will reflect favorably upon the program. This means acting in a professional, business-like manner in all situations. Programs may want to have a well-defined list of standards of conduct, a decertification official, and a forum through which an observer can air their side of the story.

Even with the best of training sessions, some observers go to sea and simply do not collect adequate data. Deploying these same people on a second trip without review of their performance and possibly retraining is a waste of valuable time and money, and possibly excludes another person with better qualifications. Some performance-based standards should be developed by program experts, especially data managers and debriefers, upon finalization of observer sampling duties and data forms. This would include addressing means of evaluating the quality and quantity of returned data through debriefing and computer data checks, and deciding on criteria that indicate (1) the observer maintains certification and can redeploy with only a briefing session, (2) certification is revoked, but the observer is allowed to retrain and try again, or (3) certification is permanently revoked.

Attachment 1. Partial suggested list of observer selection criteria for discussion by program experts.

Preferred	High	Moderate	Acceptable	Minimum
EDUCATION				
Four-year degree or higher with fisheries or wildlife background	4-year degree or higher in related field (biological sciences)	Enrolled with senior standing in natural sciences program	Completed 2-year degree in biology field.	
EXPERIENCE - AT SEA				
Prior observer in groundfish fishery.	Prior observer in another fishery, distant water preferred	At-sea experience as a biologist, non-fisheries.	Commercial fishing	No at-sea experience
EXPERIENCE - OTHER				
Biologist, involved in field research.	Commercial fisherman	Working unsupervised in isolated conditions		
PERSONAL ATTRIBUTES				
SKILLS AND ABILITIES				
REFERENCES				

Central Bering Sea Observer Program

Elements of Observer Training

The success of the Central Bering Sea Observer program depends upon how successfully a collection of individual observers can complete their at-sea sampling duties. Observer success depends heavily upon the training session. The elements to be considered in developing a viable observer training class include:

Goals and objectives
Observer duties
Training topics
Course outline
Presentation
Resources and materials
Means of ensuring understanding by trainees
Consistency
Maintaining data collection standards
Instructors and Guest speakers
Training of the trainers

When more than one group or nation are coordinating to conduct training, important additions to this list include:

Compatibility among programs
Individual program versus overall program goals
Topics which are mandatory versus optional.

Goals and Objectives. The goals of observer training are to make sure that:

- the best possible people are deployed to monitor fishing operations,
- these people are well-informed and trained on what is expected of them, what they will face, how the data are to be collected and in what format they should be in, how the data will be used, what their mission is, and
- the overall objective of collecting accurate and reliable data upon which to base fisheries management decisions is clarified.

If these goals are achieved, the post-cruise processes of observer debriefing, data checking, data entry, data editing, and data quality assurance will be achieved much more efficiently.

If these goals are not attained through training, the data will perhaps be unusable, meaning valuable funds have been wasted and perhaps a minimum critical coverage is not attained, making statistical use of the data tenuous.

Observer duties. Care should be taken not to overburden observers with excess duties, or all sampling might suffer and the data from even an excellent candidate be rendered useless due to observer fatigue. Standard data elements to be collected by all observers were decided on during the February 26-28, 1992, Central Bering Sea Pollock Fishery Observer Program Workshop. The general observer duties fall into three primary categories:

- Collecting data on haul characteristics.
- Sampling for catch composition.
- Biological sampling

Aspects pertinent to each would be explained in detail during the training process.

Training Topics and course outline. Training primarily consists of learning the fishing operations, sampling procedures, how to complete mathematical computations and fill out forms, how to identify the species expected to be found in the Central Bering Sea pollock fishery, and at-sea safety and living conditions. The following outline lists the activities and topics to cover during the training period, and are suggested as general guidelines.

1. Introductory and general topics.

   Description of fisheries and vessels.
   Description of Central Bering Sea Observer Program, Goals and Objectives.
   Introduction to duties: objectives and priorities, workload.
   Seasickness, medical advice, living accommodations, and clothing and other items to bring.
   Hardships, deportment, and conduct.

2. Monitoring fishing operations; primary observer duties.

   Fishing operations and sampling duties - emphasis on terminology, visual orientation, and safety on board.
   General instructions on data forms, ratio and proportion.
   Estimation of catch size - by the observer and by the ship.
   Obtaining haul information: Haul Summary Form.
   Catch Composition Sampling: determining a sample weight.

Methods for unbiased sampling.
Species Identification: terminology and methodology for identification of Bering Sea species.
Data entry on Species Composition Form.

3. Biological sampling duties; secondary observer duties.

Collecting biological information from salmon in samples: weights and lengths, sex, and scale sampling.
Collecting data on tagged fish.
Length frequency sampling, Length Frequency Form.
Otolith and scale sampling, Biological Sample Form.

4. Other important items.

Obtaining vessel production information and product recovery sampling.
Gear issue: familiarization and care of equipment, gear check-out, and calibration of scales.
Recording information on marine mammals as incidental take.
Discussion on hypothermia, medical emergencies at sea, fire control, and sea and shore survival.
Observer's logbook entries, methods of documentation.

Presentation Each topic can be taught as a "module". Ideally, lesson plans would be developed for each module to help guide the observer instructors. Many types of lesson plans exist. One such plan would include:

- a title,
- method of presentation,
- time allotted,
- statement of lesson goals and objectives,
- plan of presentation,
- resources and equipment,
- learning objectives—what the student needs to know,
- outline of the lesson, and
- review questions, exercises, and exams.

Resources and materials. Trainers would use a variety of resources as instructional aides, including slide presentations, overhead projectors, models of fishing gear, specimens, and others. The most important resources are a well-organized, clearly written field manual and appropriate species identification materials and specimens. Please refer to the draft field manual provided.

Means of ensuring understanding by trainees; maintaining data-collection standards. Ensuring materials are clearly understood and observers meet program standards are extremely important. Instructors must have means of quantifying a trainees level of understanding at each stage of training. Extra help in the form of tutoring may be provided to assist individuals understand topics with which they experience difficulty.

However, the instructor must also decide whether the candidate is simply not capable of fulfilling the program data-collection and performance standards. If not, the candidate should be released from training (please refer to "Standards for Observer Certification"). Most observers who serve in the US groundfish program originally participated in training under a "probationary" status, i.e., they could not participate in the fishery until certified in training and were in a temporary hire status until training was successfully completed. To these ends, the following would be included in a training course:

- Math test.
- Classroom practice of sampling methods and data entry.
- Classroom practice of haul weight estimation.
- Species identification of salmonids and lab practice review.
- In-class and take-home exercises dealing with filling out forms correctly: sampling methods, haul weight estimation, species composition, and other forms.
- Fish sexing and maturity and collecting otoliths: lab practice.
- Species identification exam.
- Final Exam.

Consistency. The above will also facilitate maintaining consistency between classes and between programs. In addition, consistency between trainers is extremely important (see below).

Instructors and Guest speakers. The best use of qualified and talented trainers needs to be made. Special topics, such as marine mammal or salmonid identification, can be taught by experts. However, trainers need to also learn these materials to act as a "back-up" for those times when the guest speaker is not available.

Compatibility between and among programs; Topics which are mandatory versus optional. Once all data forms and required observer duties have been finalized, a panel composed of observer

trainer experts from each country should perhaps convene or decide through communication the precise topics each nation must include to ensure compatibility. Each nation could also include other topics of interest in training, such as special projects which can be fulfilled without taking away from the observers primary duties.

Training of the trainers. The skills and abilities of individual trainers greatly affect the success of training. Ensuring that trainers have the same skills and abilities, as much as possible, becomes increasingly important to ensure consistency and compatibility between observers, and data, of different nations. Typically, in the U.S. North Pacific Groundfish Program, trainers are certified through a process which includes:

- Having worked as an observer in the fishery (or similar fishery).
- Familiarity with processing the data as a program staff member.
- Predilection to being a trainer, including public speaking training and experience (if possible), possessing skills in presenting materials, having enthusiasm for the job, and being a good listener (i.e., perceptive or sensitive to all kinds of people).
- Participation in a class in the position of a trainee.
- Developing lesson plans.
- Co-teaching of an observer training course.
- Teaching a full course, while being evaluated by a certified trainer.

This full scope of ensuring consistency may not be feasible for all trainers of all nations. Minimum certification standards should be decided upon by Central Bering Sea Observer Program participants. The candidate trainers should be trained in a single location. We offer the U.S. North Pacific Groundfish Observer Program at the Alaska Fisheries Science Center.

B. Observer Program Manual drafted in December 1992

OBSERVER PROGRAM MANUAL

FOR SAMPLING OF

CENTRAL BERING SEA POLLOCK FISHERIES

DECEMBER 1992

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CENTRAL BERING SEA OBSERVER MANUAL

This manual has been prepared to assist you in your duties as an observer aboard fishing vessels operating in the Central Bering Sea pollock fishery. This manual, in addition to training sessions, should adequately prepare you for your observer experience. It must be remembered, however, that conditions can change and that no set of instructions can ever be complete. It is therefore the responsibility of the observer to evaluate each situation on the vessel before deciding on a course of action. Study the manual carefully, refer to it often and consider ways in which it may be improved as a guide for future observers.

ROLE OF THE OBSERVER IN THE CENTRAL BERING SEA POLLOCK FISHERY

The international area of the Bering Sea has an important fishery resource. In order to maintain the resource, biological information must be collected from the region. Biological observers will be placed on board vessels fishing in this area to collect the information needed to assess the resource.

The primary objectives of the observers are to record fishing effort, obtain daily catch rates, determine species composition of the catches, determine the incidental takes of salmon and marine mammals, and to gather data on pollock sizes and ages. The estimates of catch rates obtained by the observers may be compared with data reported by vessels to enable scientists to estimate total daily landings of pollock.

Data collected by observers will be used in helping to assess the status of the pollock stock, estimating the bycatch rates of species other than pollock, and investigating population interrelationships.

Data obtained by the observers on catch size and species composition will give fishery scientists an idea of the catch per unit effort of pollock, an important factor in determining the status of the stock. Length frequencies and otolith collections are also vital in determining the condition of the fishery resource, and hence, of determining how much is available to be caught without causing fishery deterioration. Mathematical models used to assess the pollock population are dependent upon a measure of the current age composition of the commercial catch. Without these data and models, the ability of fishery scientists to determine the condition of the pollock stock would be diminished.

Data obtained by observers should be useful in studying particular fisheries questions, such as the stock relationships between pollock caught in the Central Bering Sea and those caught in the Eastern or Western Bering Sea. In addition to planned uses, there are many other uses of data which are not always

anticipated.

Because scientists depend on the data obtained by observers in order to assess the impact of fisheries upon the stocks, the necessity for accuracy in data collections, accurate determinations of species, and complete fulfillment of the sampling plan cannot be over stressed. Data forms must be carefully completed and checked. Sample forms in this manual serve as guidelines.

This manual, along with the training sessions, should adequately prepare you for an observer trip. Because of the variations in fish handling by different ships, observers may be confronted with sampling problems not fully covered in the training sessions. You will need to adapt the sampling methods covered in this manual and in your training to the situation experienced aboard your ship.

OBSERVER DUTIES AND PRIORITIES

Primarily, the observer's duties and priorities consist of collecting catch information, determining catch weight estimates, sampling for species composition of the catch, and collecting biological data on pollock. A list of the observer's main duties is given below.

1. Record daily fishing effort and catch weight information. This manual contains instructions describing methods of obtaining these estimates and how your estimates of catch should be used.

2. Record species, numbers, and viability of incidentally caught marine mammals and salmon.

3. Determine the species composition of the catch according to instructions in this manual.

4. Obtain biological data and samples from pollock as directed. This may include length frequencies, sexes, otoliths for determining age, stomach content samples, or other information as requested.

5. Prepare a final report for the vessel which includes all information that is pertinent.

CONFIDENTIALITY OF OBSERVER DATA

Fishermen are concerned that information you are collecting can be obtained by anyone who may be interested in finding out where they caught fish. If this is brought up to you, reassure them that the information you are collecting is handled under strict

rules of confidentiality and that you (the observer) are bound by the confidentiality rules as well. If you are asked by vessel personnel about another vessel you were on, explain that just as you can't talk about this vessel after you get off it, so you can't tell them about a previously observed vessel.

Observers must know that all data collected are the property of their government. No observer can retain or copy any data or reports following their return unless granted express permission from their government.

STANDARDS OF OBSERVER CONDUCT

Observers are expected to conduct themselves in a manner which will reflect favorably upon the observer program. This means acting in an honest, professional, business-like manner in all situations. Observers should try to abide by these basic standards of conduct:

1. Observers must diligently perform their assigned duties.

2. Observers must accurately record their sampling data, write reports, and report honestly on the fishing activities of their observed vessel.

3. Observers must keep all collected data and observations made on board the vessel confidential.

4. Observers must refrain from engaging in any activities that would reflect negatively on their image as professional scientists, on other observers, or on the observer program as a whole.

SPECIAL CAUTION ON DEPORTMENT

1. When conflicts or sampling problems occur which affect your attempts to get unbiased samples of the catch (pre-sorting of fish for example), you can usually work it out by talking with the crewmen, factory foreman or fishing master. If this doesn't help, talk to the captain and ask him to help you but don't be demanding in your attitude. Present a case which shows you have thought about both sides. Listen and consider their objections. Negotiate compromises as long as they don't interfere with your ability to get good data. If talking fails, try to get the best data possible anyway, and make notes on the problems to discuss when you return home.

2. Maintain a friendly but professional demeanor to vessel personnel. Your behavior should be governed by remembering that you are highly visible. Before acting in any given

situation, be mindful of the sensitivity of your position. Tactful, mature handling of problems is expected. Remember, you are on the job 24 hours per day.

3. Observers should never accept gifts as this may appear to compromise your impartiality. You may not accept payment for any work you perform for the vessel during your employment as an observer.

4. As an observer you should abide by the rules and regulations relating to conduct on your host vessel. Do not accept or transport any item violating laws relating to endangered or protected species.

5. Once you are aboard your sampling ship, avoid making visits to other vessels. Sometimes other ships, tenders, or catcher boats may tie up to your vessel. Consider going aboard only if your transfer there and back can be made under safe conditions and if your work performance is not affected. Do not make social visits to other vessels if they are not tied up to your vessel. Do not stay away from your vessel overnight.

6. Consider safety first in everything you do.

THE TRAINING PERIOD

Training will consist of learning how to identify the species of fish expected to be found in the Central Bering Sea pollock fishery, explanations of the sampling procedures, and information on safety and living conditions at sea. The following outline lists some of the activities covered during the training period. The outline is not necessarily complete and the items are not necessarily given in the order that they will be presented.

Observer Training Topics

Observer sampling duties - emphasis on terminology, visual orientation and safety on board.
Seasickness, medical advice, living accommodations, clothing and other items to bring.
Hardships, deportment, and conduct.
Duties: objectives and priorities, workload.
Species Identification: a general review of identification terminology of various Bering Sea species.
General instructions on data forms, ratio and proportion.
Obtaining haul information: Haul Summary Form.
Estimation of catch size - by the observer and by the ship.
Catch Composition Sampling: determining a sample weight.
Data entry on Species Composition Form.

Methods for random, representative and unbiased sampling.
Classroom practice of sampling methods and data entry.
Classroom practice of haul weight estimation.
Collecting biological information from salmon in samples: weights and lengths, sex, and scale sampling.
Collecting data on tagged fish.
Obtaining vessel production information and product recovery sampling.
Length frequency sampling, Length Frequency Form.
Otolith and scale sampling, Biological Sample Form.
Fish dissection and otolith removal: lab practice.
Discussion on hypothermia, medical emergencies at sea, fire control and sea and shore survival.
Recording information on marine mammals as incidental take.
Species identification of salmonids and lab practice review
Species identification exam.
Gear issue: familiarization and care of equipment, gear check-out and calibration of scales.
Final Exam.
Observer's logbook entries, methods of documentation.
Preparation for first day aboard.

OBSERVER CLOTHING AND EQUIPMENT

Observers will be supplied with the equipment necessary for the collection of biological data at sea. The observer is responsible for the transport and return of the sampling gear issued. The observer must make an effort not to lose and to prevent theft of the gear issued to him.

Observers will provide their own personal clothing, warm work clothes for wearing under rain gear, toilet articles including a towel, and other items of a personal nature. The vessel upon which the observer is to be stationed will be expected to provide adequate quarters and meals. It is expected that the vessel captain will allow the observer an adequate and safe space in which to carry out the sampling duties.

The following pages are lists covering the clothing and equipment necessary to perform 60 - 90 days sampling.

Suggested Sampling Equipment

Observer sampling manual
pencils and pens
eraser
calculator
sampling baskets
rope for hanging scale and securing baskets
cleaning powder for baskets and equipment

lubricating oil for scales
50 kg scale
5 kg scale
2 kg scale
large hooks for hanging scales
fish gaff
measuring tape, 30 meter or 50 meter length
measuring tape, 2 meter
sponges for cleaning equipment
scale envelopes
otolith containers
alcohol for preserving otoliths
plastic bags
clipboard
plastic sheets for recording data
data forms
binder for holding data forms
forceps
knife
scalpel
whet stone
rain pants and jacket
rubber gloves
hard hat
rubber boots

Personal Items Supplied by Observer

The following is a recommended list of personal clothing. The amount and type of heavy clothing depends on personal preference. Weather in the Bering Sea is generally cold and storms are common.

Work clothes--minimum number and type

Shirts, wool - 2 (1 light, 1 heavy)
Shirts, cotton - 2
Shirts, cotton sweat - 1
T-shirts - 3
Trousers, wool work - 1
Trousers, cotton - 2
Wool knit cap
Slippers or sandals
Handkerchiefs, large - 3
Underwear, long-thermal - 2 pairs
Underwear - 5 pairs
Socks, wool work - 2 pairs
Socks, cotton - 5 pairs
Jacket, medium wool or synthetic - 1

Other items or articles

Towel, medium cotton - 2
Pillowcase - 1
Toilet articles
Duffel bag - sturdy, medium size, old or inexpensive - 1
Small day pack or knapsack - 1
If corrective lenses are used for eyesight - a spare pair

Optional/Recommended Items

Felt/wool boot insoles (not liners) - 2 pair
Needle and thread, safety pins, and duct tape for repairs
Camera and film
Watch and alarm clock
Medication for seasickness
Athlete's foot cream
Vitamins
Hand cream
Books and magazines
Water bottle - to keep drinking water in your cabin

Vessel Data Forms for 3 months:

Haul Summary Form	20
Species Composition Form	150
Species Description Forms	20
Length Frequency Form	45
Biological Sample Form	30
Gear Diagrams	3

Preparation and Care of Sampling Equipment

1. Protect your gear from loss overboard and from theft. Do not leave gear items such as baskets and scales on the weather deck unless there is no alternative and they are well secured. Stow all sampling gear when you are finished using it and inform the skipper and crew not to borrow or use your equipment without your permission.

2. Keep all paper products and small, loose equipment (pencils, pens, thumb tacks, scissors, counters, etc.) protected from moisture throughout your trip.

3. Most important: Every day before use, the weighing scales must be checked over. Keep them cleaned and oiled. Adjusting screws must be kept coated with grease. The scales have steel springs inside which will rust - oil must be squirted up inside the scales.

4. Tape measures, calipers, and thumb counters must also be cleaned (and oiled if necessary) each day when used. (Be

careful to keep oil away from plastic data forms, since pencil marks tend to wipe off a slick surface).

Calibrate your scales when you get them. Then prepare a known weight by selecting items which may be easily assembled later. (i.e. a basket, wheels, and books). List the items weighed and their total weight. This known weight may then be used later to check your scale adjustment or to check the accuracy of shipboard scales.

Prior to using your baskets or other containers for weighing, weigh the empty containers so you will know how much to subtract from each weight figure to reflect the weight of the contents only.

Accurate weights are sometimes hard to obtain when the ship is rolling. When possible, secure the top of the scale directly to a fixed structure, such as a ceiling brace. If the top of the scale has to be attached to the ceiling by a length of rope, use three ropes attached to widely separated points on the ceiling to minimize the swing of the scale. Keeping the length of the ropes to the basket short also helps. Scales located close to the center of the ship tend to swing less. If a shipboard scale is available for your use, you should use it, but check it for accuracy first.

ARRIVAL ABOARD THE SHIP

Observers must be aware that fishing schedules are often changed by weather, mishap, break-down or fishing success and these events often change observer schedules.

Vessel conditions vary widely depending on the ship type and size, company and skipper's policies, and the fishing success. "Conditions" include cleanliness and upkeep, safety, comfort of quarters, quality of food, general attitude, and good personnel management. Observers must be flexible as only a few generalities on what to expect can be made. Personal quarters are usually small. The most personal luggage one should ever carry on is a duffle bag.

Your work on board your fishing vessel will be very different than the work of the rest of the crew. In order for you to be able to do your job with the fewest problems, there are some guidelines which have been developed from experience. Show respect to others and it will be returned to you. One way to accomplish this is to make a conscious effort to remain clean and neat. Clean up after yourself and help where you can, as you will need their help in return. Do your best to maintain a good attitude. Adaptable observers with a good attitude are apt to receive more consideration than those who criticize and make demands.

Illness and Accidents Aboard

Seasickness often hampers observers at the beginning of a cruise, but give it time - most of the effects of seasickness disappear after a few days. Indigestible stomach contents, unpleasant fumes or cooking smells, and anticipatory fear will trigger seasickness. The symptoms are nausea, headache, drowsiness, and depression. This is normal, it is just difficult to live with. Remember, no one ever dies of seasickness, but weakness and dehydration can be dangerous. You must make yourself drink water or some non-acidic juice, not coffee, tea or alcohol, and try to eat some mild food such as rice or bread to keep up your strength. Take some seasickness medication along even if you don't plan on using it.

These actions may help you overcome seasickness and adapt to your vessel:

Try not to think about seasickness, put it out of your mind, force yourself to think of other things.
Practice releasing the tension in your muscles; as soon as you begin to feel apprehensive try and relax.
Avoid unpleasant smells (especially tobacco, damp clothing, and vomit). Stay away from the galley
Below deck: lie down, keep your eyes closed.
In the saloon: fix your eyes on a freely suspended object.
Seek out cool, fresh air and take calm, deep breaths.
Where possible, keep away from enclosed spaces, go out on deck.
Reduce the amplitude of the motion stimuli: keep amidships or astern, avoid the forward end of the ship.
Try not to sit and let yourself be rocked passively back and forth with the motion of the boat.
When standing, avoid leaning against anything, stand erect and make active compensatory movements to keep your balance.
Try to move your head as little as possible.
Focus on the horizon; watch the swell and anticipate the movement of the waves
Participate in the normal duties on board.
At all events see a job through to the end, do not give up on it.

Determine that you will persevere through the mental and physical discomfort due to seasickness, do not dwell on fear. It is simply a matter of adjustment. If severe discomfort persists for more than five days let the captain know. He may not be able to help you, but he will be aware of your condition in case your health gets much worse.

Safety Aboard Vessels

Fishing vessels have many potentially dangerous areas. The observer must always be alert and should take care to avoid injury. The following points must be adhered to while on the vessel:

1. The first day aboard, note where the lifeboats, life preservers, and other safety devices are kept. Memorize the exit route from your cabin, the factory, the galley, and other locations where you spend a lot of time.

2. During your first talk with the captain, ask him to explain to you what to do in the event of a major emergency such as a fire aboard the ship, a serious collision with another vessel, or other conditions which might require abandoning the ship.

3. Be cautious whenever wading through fish since fish spines can penetrate rubber boots and cause painful wounds to the feet.

4. Clothing with loose strings or tabs should be avoided, as they might become caught in the equipment or conveyor belts.

5. Don't run aboard ships, particularly up stairwells. Slipping, tripping, and falling are the most common sources of observer injury. These accidents often happen when an observer is in a hurry. Specifically, watch out for slick spots where the deck is wet and oily or frozen, step carefully over the half-foot coaming rising from the bottom of metal latch doors and passageways, and look out for low overheads in vessel stairwells and watertight doors.

6. The observer should not stay outside on the aft deck during rough seas. Fishermen are often swept forward on the deck by waves rolling up the stern ramp. When the observer is outside, he should remain in full view of another person at all times.

7. Cables which break under strain frequently kill sailors. Whenever a cable is subjected to tension, stand in a place where a backlash would not hit you. If your sampling station is on deck, do not work while a trawl is being set or retrieved. Instead, interrupt your work to go to a safe place during the process. When nets are being hoisted off the deck, stand well clear. Heavy nets will fall when the suspending cables part.

8. When working near the exit chutes in the factory floor, where bycatch and factory offal wash out, the observer should be extremely cautious not to slip and fall in the

wash of bilge water.

9. Observers are cautioned not to pry loose any fish caught in the spaces of conveyor belts or other machinery, since this may result in getting a finger or hand mangled in the machinery.

10. Factory processing areas are crowded with machinery, electrical lines, and conveyor belts. It is often difficult to get to the area where an observer needs to sample because of the maze of equipment. Climbing over, under and around heading, filleting, and skinning machines on oily and wet floors is extremely hazardous. Observers must watch carefully where they step and where they grab for handholds.

11. Treat all minor cuts, especially those on hands, with antiseptic to avoid infection from fish slime. Poisoning from fish slime is called cellulitis and is a form of staph infection. Should a staph infection be left untreated and allowed to develop, your lymphatic system becomes involved and the threat to your health becomes much more serious than simply a pair of inoperative hands. Wash hands thoroughly after sampling in a solution of very hot water and an antiseptic such as iodine. Disinfectants such as chlorine bleach or alcohol tend to remove your skin's natural chemicals and prolonged use may make you even more vulnerable to fish poisoning.

12. Take extra precautions against infection when handling dead marine mammals. As these animals have similar biological systems to our own, organisms which infect them can infect us. "Seal finger" is a fungal infection of the hands which can easily be contracted.

13. Ask ship personnel which water sources are safe to drink. Some ships have lines containing water for washing and not drinking.

Safety in At-Sea Transfers

Some observers will board and disembark their vessel at dock, but a transfer at sea may be necessary for many observers. Transfers between vessels are potentially hazardous, especially in rough weather. The observer must assume responsibility for deciding whether or not to transfer based upon his own evaluation of the transfer conditions.

There are general guidelines for allowable safety limits during transfers. Conditions such as method of transfer and vessel size, swells versus waves, current and impending weather, good visibility and distance to cross affect the decision as to whether or not to transfer. Observers must use their best

judgement. Be cautious--not foolish. Do not be forced into transferring against your better judgement by an anxious or impatient captain. Whenever possible be preceded or accompanied by a crewman. Always go with an experienced crewman if you are transferring in a small boat or raft. Never transfer via a small boat if you can't see your destination. If boarding a small skiff or inflatable boat, see that the engine has been started and warmed up, and that there are oars stowed as a backup. As general guidelines, do not transfer at dusk, in darkness, in heavy fog, or in any other low visibility conditions. Transfers involving a small boat or raft should never be carried out at night. Observers should not transfer when the sea state is two meters or more. Points to remember when transferring:

1. Observers should wear life vests at all times on skiffs or other small-sized vessels and while transferring.

2. Observers will not encumber themselves with baggage when transferring vessels. Balance is important. Both hands must be free during transfers.

3. All baggage will be secured with lines and transferred via rope lines or cargo nets. Observer baskets have been lost overboard because they were thrown between ships without lines attached.

4. Given a choice between using a Jacob's rope ladder or a gangway to board a ship, in most cases use the Jacob's ladder since the use of a rigid gangway in rough seas can be extremely hazardous to the observer and to the transfer boat.

5. If a cargo net, transfer basket, or cage is used to transfer observer or baggage, make sure that a line is attached to the conveyance from both vessels for greater control and to reduce swinging. The observer should maintain a crouched (knees bent) position as opposed to sitting or standing with straightened legs, to avoid back injury. Be sure to wear your life vest when using this mode of transfer. Keep your arms, particularly elbows and fingers, inside the conveyance when transferring.

First Days On Board

As quickly as possible, the observer should adapt to the new surroundings, meet people, and make preparations for work. Soon after boarding you should have a meeting with the captain. Cooperation from the captain, mates and crew is essential in order to obtain the unbiased samples the observer needs for his work. It is important at this meeting to set the tone for a friendly but business-like working relationship. If the captain

is receptive, take this opportunity to mention the following points:

1. Tell the captain that you want to see the ship's fishing logs regularly.

2. Ask to be informed, in advance, of changes in the fishing schedule so that you may adjust your schedule accordingly.

3. Ask to be notified if any marine mammals are found in the catches; request that all dead mammals be held for your examination.

4. After having done your own survey of safety equipment and instructions ask the captain additional questions. Ask about the location and operation of special emergency equipment, what are the procedures in case of an emergency such as fire, where is the radio and how does it operate, what are the working channels of nearby vessels, are there any hazards that you should be aware of?

During the first few days aboard your ship familiarize yourself with life on board. Prepare to begin your work by noting the following:

1. When the deck is inactive, perhaps on the way to the fishing grounds, make measurements which will aid you in estimating codend dimensions. Then watch the net retrieval and handling. Decide when and where you will need to take additional measurements and which crewmen to ask for help.

2. Watch how and where the codends are opened and how thick and fast the fish are dumped. Look to see if the crew does any sorting on deck and whether different hauls are mixed in the tanks.

3. Notice where the catch is sorted by species and size and what is the destination of fish on each line of conveyor belts. What products are being made?

4. Consider the location of your sampling station. Remember, you have to be present at, or ahead of, any sorting area. If at all possible, avoid having to haul containers of fish long distances or up or down stairs. You need a place where you can gather your samples, have a few containers of fish around you and a place to hang your scale. Adequate lighting will be necessary and you will need to locate the nearest hose for cleaning yourself and your area.

5. Try collecting one or more containers of fish. Familiarize yourself with the species being caught, and start writing species descriptions. Practice sexing the pollock and

taking otoliths.

6. Work out routines for sorting, weighing, and counting fish.

7. Get started with the most obvious methods for making catch weight estimations and determining sample weights. Then after your work is underway, consider variations or other methods which may improve your sampling.

OBSERVER OBJECTIVES AND GENERAL INSTRUCTIONS

The main work objectives of observers are to make independent estimates of catch weight, determine the species composition of the catch, collect biological data on pollock and salmon, and record any incidental take of marine mammals.

Since ship design and procedures vary from ship to ship, it will be the responsibility of the observer to select the best sampling methods to obtain the needed data. In the following sections, the methods of sampling will be outlined. To use any of the prescribed sampling methods, the observer will be relied upon to devise and apply good, statistically sound, fish collection techniques.

When conducting biological sampling, the most important thing to remember is to take random, unbiased samples such that your data will be representative, not of any particular catch but of the vessel's catches over time. Random samples are necessary in all data collections. Accuracy is important in all aspects of the work, including: the actual sampling, recording the data on plastic data sheets, and transferring the data from the plastic data sheets to the final paper copy. The need for random, unbiased sampling and accuracy cannot be stressed too much.

SAMPLING DUTIES FOR OBSERVERS

Every Haul:

1. Obtain or compute haul data on fishing location, depth, effort, and total catch weight (Haul Summary Form).

Sampled Hauls:

2. Sample for species composition of catch (Species Composition Form).

3. Estimate haul weight (Haul Summary Form) from as many hauls as possible. Estimates should be made of some hauls that were not sampled as well as of sampled hauls.

Biological data from salmon:

4. Sex and identify to species all the salmon in your sample if

possible, or take a random sub-sample for sexing the fish (Species Composition Form).

5. Take length measurements of all salmon in your sample (Length Frequency Form). When many salmon appear in your sample, take a random sub-sample, such as every third fish. A sub-sample should be of at least 20 fish.

6. Collect scales from salmon in your samples for species confirmation and age determination (Biological Sample Form).

7. Check all salmon for missing adipose fins or other fin clips or marks. If you collect a tag be sure to record all pertinent data as requested in the "Tagged Fish" section of this manual.

Every Day:

8. Take length measurements of at least 200 randomly selected pollock per day (Length Frequency Form). The otolith collection must be a subset of the length frequency collection.

9. Otolith collection - Try to collect 20 pairs of otoliths per day, but no more than that. Follow directions later in this manual (Biological Sample Form).

Other special projects - if assigned any other special project, such as stomach sampling, or parasite studies, conduct work according to instructions given.

Per Vessel:

Evaluate the accuracy of the vessel's catch weight estimations.

Describe the fish processing products. Record the product recovery rates or conversion factors the ship uses, if any. List which species are discarded.

GENERAL INSTRUCTIONS FOR DATA FORMS

In gathering the necessary data, observers must occasionally be inventive to overcome sampling problems, but once the data are ready to be transferred from the plastic data sampling forms to the paper forms, all creativity must cease. Certain data columns must always be filled in and they must be filled in a certain way, with leading zeros in some places but not others, zeros filled in behind printed decimal points, and decimal points added by observers in other cases. Refer to the specific directions and examples for each form. If you do need to make a comment on the data, place the comment on a portion of the form which is not keypunched.

The forms should be neat - all the numbers should be precisely

printed so that they are legible. Sloppy forms multiply the number of data entry mistakes and sometimes require guesswork to interpret. Use a sharpened pencil, not a pen, to fill out all forms so that erasures can be neat if changes have to be made.

Much of the Haul Summary Form can be filled out from the ship's fishing logs. Observers should take care to record the correct information and avoid making copying errors. The vessel position data is needed for all of the data, so if these are missing, other data cannot be used.

Cruise Numbers And Vessel Codes

You will be assigned a number which will identify you and your set of data for your vessel. The number which identifies you is the "cruise number" and the number which identifies your vessel is the "vessel code". If you are sampling in December and over the new year transition, you will be assigned a new cruise number for the new year's data. Start a new page for each set of forms and start their numbering again from page one as of January 1st (0000 hours GMT, between December 31 and January 1).

Page Numbering

On the top of each form is a phrase "page ___ of ___." This helps to keep the forms in order and alerts anyone working with the data forms if a page is missing. Each set of forms, for each cruise, should have pages numbered separately and consecutively. Record the page number every time you begin a new side of each form and fill in the total number after the cruise is complete. For example, if you filled out 58 Species Composition Forms, then the first sheet will be "page 1 of 58" and the last sheet will be "page 58 of 58". The Biological Sample Forms are further subdivided by species so that you will have a separate set of forms for the salmon from which you collect scales, and a set for recording information on pollock otoliths or other biological samples.

In all your data:

≥ 5 is rounded up, < 5 is rounded down.

Example: rounded to two decimal places: .52499 = .52

(When rounding, look only at the first digit to the right of the place you are rounding off at. In the example above, since we are rounding off at the hundredth's, we would only look at the "4" and thus leave the "2" as it is. We would not look at the "9" and change the "4" to a "5" and continue to round the "2" to a "3" thus getting an answer of ".53".)

HAUL SUMMARY FORM

The observer's objective is to determine and record the best information available on fishing effort and catch. Catch per unit of effort, the type of nets used, and where in location and depth the nets are deployed are the basic pieces of information needed to monitor the harvest of pollock in the Central Bering Sea. The haul summary information constitutes the basis of all the rest of the data gathered by an observer aboard a vessel. If this form is not complete and correct, the rest of the data collected will be useless. The collection of haul summary information is the top priority for an observer. All subsequent sampling data for a vessel is tied to the Haul Summary Form by the dates and haul numbers. Be certain your haul and date correlations are correct on this and all other forms.

HAUL SUMMARY FORM INSTRUCTIONS

This form summarizes fishing effort and total catch by haul for factory trawlers. Obtain the data for this form from the ship's logs, from vessel personnel, and from direct observation. Vessel logbook information may need to be adjusted if it is not correct. Check carefully to see that no errors are made in copying the data to the forms and that the data are reasonable. Points to note:

1. An entry must be made for every day you are assigned to the vessel. Make certain that you have all of the hauls recorded. **Do not** make the mistake of recording only the sampled hauls.

2. Record your name and nationality and the name and nationality of the vessel you are observing. Use the following nationality codes for yourself and your vessel:
   Codes: 1 - Republic of Korea
   2 - Japan
   3 - Peoples Republic of China
   4 - Poland
   5 - Commonwealth of Independent States

3. Place an "X" in the column to the left of the date to indicate which hauls you sampled for species composition.

4. You should record haul numbers in numerical sequence and in ascending order. A given haul number should be used only once - there can be no duplicates. Make sure that the haul numbers do not exceed 3 digits. If the haul number recorded in the fishing log is 1657, for example, then drop the first digit and record the haul number as 657. This will enable you to compare your data more easily with the ship's logs. All hauls must be recorded unless there was a gear malfunction resulting in a zero catch. If a zero catch is

not due to a gear malfunction then the haul must be recorded. A haul number must be assigned to every haul. If you reach number 999, the next haul should be "1", not "0." Haul number "0" means a non-fishing day. Non-fishing days will be explained later in this section.

5. Record the code for gear type based on the style of the trawl net. Leave this column blank temporarily if the gear doesn't fit the categories given below.

   Codes: 1 - pelagic trawl
   2 - bottom trawl
   3 - pair trawl

6. Record the gear performance code:
   Codes: 1 - no problem
   2 - gear twisted resulting in reduced or no catch
   3 - net ripped
   4 - any other problem which results in reduced or no catch; write a note of explanation in an area not used for recording data

7. If there were no hauls retrieved on a day (due to bad weather, mechanical breakdowns, traveling etc.) record "0" in the haul number column, and record the GMT noon position. Comment on the reason there was no fishing. All days at sea must be accounted for in this manner.

8. For every haul the location recorded should be the <u>haul retrieval position</u> - the location of the ship when a particular haul begins to be retrieved, or, when the winches begin bringing in the cable. Check the latitude and longitude for all positions recorded on this form to make sure that they are reasonable - for example, 58° 63'N does not exist; double check positions that indicate large movements if you have not been aware of any. Plot a few positions on a chart yourself to verify that they correspond to where you believe yourself to be. Each haul must have a position. On non-fishing days, record GMT noon position in these columns. All latitudes are assumed to be North; record the codes for "east" or "west" after longitude.
   Codes: 1 = east
   2 = west

9. The time system used on this and all other forms should be Greenwich Mean Time (GMT) and dates. Times must be recorded according to the 24-hour system (2:00 in the afternoon = 1400).

10. A haul is assigned to a day according to the time the vessel begins to retrieve the net from the fishing level ("begin retrieval" time), which is not necessarily the same day the

net was set or the day that you sample. Thus, hauls retrieved before 0000 hours GMT are attributed to the previous day, and hauls retrieved on or after 0000 hours GMT are assigned to the next day.

11. The time when net retrieval begins is recorded under "Begin retrieval". "Nets at depth" is the time that the net first reaches the fishing level after the winches stop paying out cable.

12. If "nets at depth" or "begin retrieval" occur exactly at midnight, the time should be recorded as "0000" hours, not "2400" hours. If this occurs in the "begin retrieval" time, the date should be checked accordingly.

13. Double check haul times to see if they are reasonable. An overlap in haul times for two hauls made by the same vessel is an obvious error.

14. Record the "nets at depth/begin retrieval" times as well as the "fishing duration" (in minutes). In most cases the duration will be the difference between "nets at depth" and "begin retrieval". If the **actual** fishing duration is substantially different than the duration which would be obtained by calculation from the "nets at depth/begin retrieval" times, record only the duration and "begin retrieval" time. This may occur if the net is raised and lowered several times during the haul. In this case, minutes duration would be more accurate than "nets at depth/begin retrieval" times. Note the reason for the unusual entry at the top of the form.

15. The average fishing depth is assumed to be in meters. Record depths only to the nearest whole number, no decimal values.

16. Record the average trawl speed to tenths of a knot.

17. Official total catch (OTC): in the observer's opinion this is the best estimate of total catch weight for each haul. Total catch weight is the round weight of all species caught in the haul. All subsequent uses of haul weight by the observer in the observer data will use these figures. Thus, it is the "Official" Total catch. There must be an Official Total Catch recorded for every haul recorded on this form. It is recorded in metric tons and must be made to two decimal places.

18. Observer's estimate: this is an estimate made by the observer from independently derived or verified information. The observer should make independent estimates of as many of the hauls as possible. Instructions and information on

making estimates of haul weight follow. Record the weight estimate in metric tons to two decimal places.

19. Record the sea surface temperature to one decimal place.

    Record the temperature at fishing depth (if available) to one decimal place.

    Use the following codes for sea state (Beaufort Scale):
    0 - calm, glass-like surface, sea height 0 meters.
    1 - calm, rippled surface, sea height 0-0.1 m.
    2 - smooth wavelet, sea height 0.1-0.5 m.
    3 - slight waves, sea height 0.5-1.25 m.
    4 - moderate waves, sea height 1.25-2.5 m.
    5 - rough seas, sea height 2.5-4.0 m.
    6 - very rough, sea height 4-6 m.
    7 - high seas, sea height 6-9 m.
    8 - very high, sea height 9-14 m.
    9 - phenomenal, sea height greater than 14 meters.

20. Leading zeros should be recorded in the date and time columns only, as needed. A line should be skipped after each day. Any notes, or comments (other than notes for non-fishing days) should be placed in a part of the form that is not for recording data.

Checking the Haul Summary Form: The correct haul/date correlation, retrieval position, duration, and total catch weight are the necessary items--without this information the observer's sampling data cannot be used. The observer must cross-check all data for accuracy. Check the "Begin Retrieval" time of the last tow of each day. The tow cannot span midnight and be the last tow. Check to see that no two haul times overlap. Check any change in degrees of latitude and longitude. Unless the minutes of latitude indicate the position is close to the next degree, changes of degree would mean long distances traveled or a recording error. Look at each whole page of the Haul Summary Form for blank spaces where data may be missing.

VESSEL FISHING LOGS

A captain may keep several types of records or logs. He may keep fuel and fishing logs for himself or for his company. Your job is to obtain the best information on the fishing catch and effort from these ship's logs, from vessel personnel, and by direct observation, and accurately record the information on your Haul Summary Form. **All of the tows made while you are aboard must be recorded on your Haul Summary Form whether you sampled them or not.**

The captain may wish to use the observer's sampling data as a basis for his own logbook entries. Observers may provide the vessel's officers with copies of their sampling data obtained from that vessel.

CRUISE #			VESSEL CODE					YEAR	
1	2	3	4	5	6	7	8	9	10

HAUL SUMMARY FORM

OBSERVER NATION
1 2 3 4 5

VESSEL NATION
1 2 3 4 5

OBSERVER NAME EXAMPLE

VESSEL NAME

HAUL SAMPLED	DATE				HAUL #	GEAR TYPE	GEAR PERFORMANCE	HAUL POSITION			FISHING TIMES IN GMT		FISHING DURATION IN MINUTES	AVERAGE FISHING DEPTH	AVG. SPEED KNOTS	OFFICIAL TOTAL CATCH (METRIC TONS)	OBSERVER TOTAL CATCH ESTIMATE (MT)	SEA SURFACE TEMP. (C)	FISHING DEPTH TEMP. (C)	SEA STATE
	MONTH		DAY					LATITUDE (NORTH)	E/W	LONGITUDE	NETS AT DEPTH	BEGIN RETRIEVAL								
	11	12	13	14	15 - 17	18	19	20 - 23	24	25 - 29	30 - 33	34 - 37	38 - 40	41 - 43	44-45	46 - 50	51 - 55	56 - 59	60 - 63	64
	0	8	1	4	171	1	1	5907	2	17946	0625	1137	312	202	3.2	42.50	42.50	6.1	4.4	3
X	0	8	1	4	172	1	1	5915	2	17930	1410	2100	410	215	3.2	38.25	38.25	6.1	4.4	3
																.	.			
X	0	8	1	5	173	1	1	5832	1	17925	0515	1105	350	350	3.0	28.60	28.60	6.2	3.2	4
																.	.			
X	0	8	1	6	174	1	1	5705	2	17710	0130	0700	330	240	3.1	16.00	.	6.5	4.3	5
	0	8	1	6	175	1	2	5710	2	17725	0830	1145	195	230	3.1	0.00	0.00	6.5	4.3	5
X	0	8	1	6	176	1	1	5707	2	17730	1510	2330	500	230	3.1	32.30	32.30	6.4	4.3	6
																.	.			
	0	8	1	7	0			5708	2	17722	No fishing, rough seas					.	.	6.2		7
																.	.			
X	0	8	1	8	177	1	1	5720	2	17710	0530	1245	435	215	3.1	45.00	46.10	6.2	4.5	4
X	0	8	1	8	178	1	1	5735	2	17735	1420	2050	390	220	3.2	48.50	48.50	6.3	4.5	3
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OFFICIAL TOTAL CATCH WEIGHT ESTIMATIONS

Total catch weight is the fresh weight of all species caught in a haul whether utilized or not. The observer must determine what the best available weight figure is for each haul made by the ship, whether sampled or not. The observer will be using that value in all subsequent references to total catch weight.

Acceptable Methods For Obtaining Official Total Catch Estimate:

1) The observer makes an estimate of catch volume for every haul and calculates the weight with a volume to weight ratio (density) obtained from each sample. Density values may be averaged for non-sampled hauls. The observer's estimates are preferred over the captain's estimates because the observer makes actual measurements to determine catch weight. The captain usually only makes a visual estimate which may reflect what he wishes the catch size to be, rather than what it actually is.

2) The observer's estimates are used when available but the captain's deck estimate is recorded for catches not estimated by the observer.

3) Add the weight of discards, as determined by the observer, to the retained catch weight for the haul derived from production data.

4) The skipper's deck estimate is recorded as the Official Total Catch (OTC) weight but the observer continues to make independent estimates for comparison.

Explanation of Official Total Catch Weight Estimation Methods

Method 1: The methods for observers to use in making volumetric estimates of catch size and weight are presented in the next section. If the observer's catch estimates are being used as the official total catch because they are the most accurate, the observer should try to estimate all of the catches brought in while the observer is aboard.

Method 2: If making an observer estimate for Official Total Catch (OTC) weight is not possible for every haul, record your observer estimates when possible and record the captain's deck estimates for the hauls which you do not estimate. The captain or other officer on watch will usually make a deck estimate by looking at the codend of the net and counting the number of sections full of fish. The codend has reinforcing cables or "expansion straps" around the circumference at regular intervals. The amount of fish between each strap may be considered a consistent unit of weight. Sometimes the captain's deck estimates may not be accurate. He may overestimate a large catch and underestimate a small one. The captain's deck estimates are

usually recorded in his fishing log. The observer should make comparisons between his own estimates and the captain's estimates to determine how accurate the captain's estimates are.

Method 3: An accurate total catch weight may be calculated using the retained catch weight for a haul (calculated from factory production data) added to the weight of the non-utilized, discarded fish from the same haul. The retained catch weight of the haul can be obtained by determining the amount of product made from that haul and applying a product recovery rate or conversion factor to obtain the round weight of the utilized fish. Remember: retained weight must always be whole fish weight. The methods used to determine the product recovery rate or conversion factor are explained at the end of this section.

This method can only be used after a haul has been sampled by the observer and has also been completely processed.

Round weight retained fish + Total weight discarded fish = OTC.

Discards consist of bycatch species and undersized or damaged pollock. The observer must be present and sampling in order to make estimates of the discards before he can use this method to calculate official total catch. To obtain total catch for hauls which you did not sample, calculate an adjustment factor for the day (see example below) and multiply the retained catch for the unsampled haul by the adjustment factor for that day.

$$\frac{\text{sum of calculated } \underline{\text{total}} \text{ catch weights of the sampled hauls for the day}}{\text{sum of the } \underline{\text{retained}} \text{ catch estimates of the sampled hauls for the day}} = \text{adjustment factor for the day}$$

adjustment factor for the day x retained catch estimate for a non-sampled haul = total catch est. for that haul

Example: A ship made four hauls in one day, and the observer sampled three of them. The official total catch estimates for the three sampled hauls are 52.00 metric tons, 43.00 mt, and 44.00 mt. The retained catch weights for these same three hauls are 51.75 mt, 40.00 mt and 41.35 mt. The observer estimates that the retained catch weight for the unsampled haul is 36.67 mt.

$$\frac{52.00 + 43.00 + 44.00}{51.75 + 40.00 + 41.35} = \frac{139.00}{133.10} = 1.044 \text{ (adjustment factor)}$$

1.044 x 36.67 = 38.30 mt total catch weight of non-sampled haul

When determining Official Total Catch from production information the observer must know when each haul was processed. A haul may

be processed on a different day than it was retrieved, so the factory manager may record production information with hauls retrieved the next day. The observer must be able to differentiate each haul.

Observer verification of production is preferred but when this has not been done, product weights from the ship's logbook may be used if they are recorded. The appropriate questions should be investigated though, such as: Which catches made up the day's production totals? What is the average unit weight per tray of product? What does the factory manager estimate the product recovery rates or conversion factor to be? How does the ship keep track of the number of units of product produced?

Method 4: The observer may also use the captain's deck estimates for all Official Total Catch (OTC) weights. This should only be done when the observer feels he cannot make good estimates of his own, or he is unable to obtain any estimates at all. The observer must still try to make his own estimates (as described in the next section) which will be recorded in the "Observer Total Catch" estimate columns on the Haul Summary Form.

Methods, Detailed Review

1) The observer makes volume estimates of all catches from the live tank, fish bin, or the codend, and calculates weight with a volume to weight ratio (density value) obtained from each sample. An average density is used for non-sampled hauls.

2) Observer's volumetric estimates are recorded when available but captain's deck estimate is recorded for catches not estimated by the observer. The observer should make notes of the captain's deck estimates, observer's volumetric estimates and their differences by haul.

3) Calculate round weight of retained fish from product weights using observer-verified counts of product, product unit weights, and product recovery rate or conversion factor values and then add the weight of discarded fish to attain the official total catch. Discard weight can be (a) verified by observer, (b) weighed by observer, (c) determined by counting containers of discards and applying an average unit weight, or (d) estimated by eye and/or by reports.

4) The captain's deck estimate is always recorded as OTC but the observer continues to make independent volumetric and/or production data estimates for comparison whenever possible.

PRODUCT RECOVERY RATES AND CONVERSION FACTORS

Observers can use product recovery rates or conversion factors to determine total catch weights. A **recovery rate** represents the proportion of the organism that is used in the factory products. If the weight of product is divided by the recovery rate, the resulting number is the round, or whole, weight of the fish used. A **conversion factor** is the reciprocal of a recovery rate. The conversion factor can be multiplied by the product weight to obtain the round weight (whole weight of the fish). It is best if the observer can determine the rates on his own, but that is not always possible. Surimi and fish meal recovery rates may be impossible for observers to determine.

If the observer is using product weights for determining total catch weight, he should weigh some of the individual units of product to make sure that any product weights recorded by the vessel are accurate. The observer should try to make product recovery tests and unit weight checks once per week.

Once the observer has determined product recovery rate and unit weight, he must then determine how much product was made from each haul. He can do this by counting the number of units of product and/or by talking to the factory manager and reading the production logs. In order for an observer to use this method for determining Official Total Catch he must make certain that he knows which products came from each haul.

When recovery rates are used in estimating the weight of a catch from the weight of products produced from that catch, use the following equations:

$$\frac{\text{Product Weight}}{\text{Recovery Rate}} = \text{Whole (Round) Weight (before processing)}$$

Whole Weight of utilized fish + weight of discarded fish = OTC

Recovery rates are commonly expressed as a percent or as a ratio. Headed and gutted pollock may have a recovery ratio of .62 to 1, or 62% recovery, while fish frozen whole would have a recovery ratio of 1.00 to 1, or 100% recovery. Since conversion factors are reciprocals of recovery rates they are always greater than 1. From the above example, a recovery rate of .62 is the same as a conversion factor of 1.61 (1 ÷ .62 = 1.61).

A wide range of recovery rates are used to describe the utilization of pollock into a variety of products. The type of processing, the size of the fish, the area and season of the year, the experience of the processing crew, and the vessel type may all affect the recovery rate of pollock. Since you may be using recovery rates to help determine total catch weight,

observers are asked to record the rates used on their vessels, and if possible, to run tests to determine recovery rates on their own.

To determine your own recovery rates for particular products, you must observe the following procedures. First, you should obtain a sample of the fish which are waiting to be processed. **The fish you choose should be of the size and condition of those that are normally processed by your ship.** For example, in order to obtain the recovery rate for pollock fillets, select a container of pollock of the sizes normally used. Your sample must be taken at random. Count and weigh the sample of whole fish before processing. This is called the "whole weight", "fresh weight" or "round weight". After you have collected your sample there are two different methods for determining the recovery rate.

1. For the first method have the selected fish processed by the factory crew as they would normally do, then weigh the resulting product made from those same fish. The weight of the product divided by the weight of the fish before processing is the recovery ratio.

$$\frac{\text{Product Weight}}{\text{Fresh Weight}} = \text{Product Recovery Rate}$$

This first method is useful when the number of samples and the number of fish per sample is limited.

2. In the second method, the observer counts and weighs a sample of fish waiting to be processed for a particular product, as before. The observer then collects products from the same **number** of fish but not necessarily the **same individual** fish. For example, if you weighed 60 whole fish, which were to be made into fillets, you would need to weigh 120 fillets. The products weighed should be from the same catch of fish.

The second method can be very accurate when samples are large and there are several repetitions of sampling. The second method has the advantage of being easier to perform because there is less interference with the processing line. Also, as the product to be sampled cannot be predicted by the processors, intentional bias can be avoided. There is one acceptable variation on either method. In many factories, the factory manager will conduct his own product recovery testing. If he follows the same procedures described here, and you can witness, or assist, the entire procedure and record the weights for yourself, this is an acceptable method of obtaining your data.

OBSERVER TOTAL CATCH ESTIMATES

The observer estimate must be an independent, unbiased, measured estimate of catch weight. Each component of the estimate must be obtained by the observer or the observer must be working with the person collecting the information. Without doing this, how are you to know how accurate the captain's deck estimates, or your choice for Official Total Catch, are? Your estimates of total catch are an important part of the reason you are observing on that vessel, so you should do your best to get good data. Do not record any visual estimates as "Observer Estimate", because you probably learned how to make visual estimates from the captain, and you are there to check his estimates. Continue to document your measurements and calculations and record your estimates of catch weight on the Haul Summary Form for every haul you estimate. When your observer estimates are recorded as the "Official Total Catch", they must also be recorded in the columns marked "Observer Estimate" on the Haul Summary Form.

Observers should make an independent estimate of the total catch weight of as many hauls as possible. The observer should make an effort to estimate the weight of non-sampled hauls as well as sampled hauls. Each component of the estimate is measured or verified and documented by the observer, and estimates are recorded on the Haul Summary Form.

Observer estimates are made by measuring the volumes of fish in live tanks, holding bins or codends. The volumes are converted to weight estimates using the observer's density sampling data.

Methods for Observer Estimates of Codends

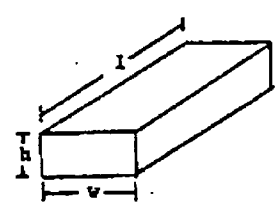
As scientists, observers must have data to verify their estimations. Codend measurements are taken to determine volume of fish (m^3), and that volume is multiplied by weight-per-volume (mt/m^3, density) to derive an estimate of the catch weight. Observers must never record estimates made by guessing the weight of the codend on the Haul Summary Form. The first step in the estimation of the volume of fish in the codend is to decide which geometric shape a particular codend most closely resembles: a rectangular solid, a cylinder, an ellipsoidal solid, a semi-ellipsoidal solid, or perhaps a combination of two of these shapes. Determine the needed dimensions for volume calculation of the chosen solid. Then measure the codend of fish or use known dimensions to gauge the net size, for example using measured markings or structures on deck, deck width, height to your shoulder, or other standards of reference.

On some vessels full codends will be emptied a portion at a time while the remainder hangs off the stern ramp, still in the water. It is necessary for the observer to measure the volume of fish in several net sections to determine the volume per section and then

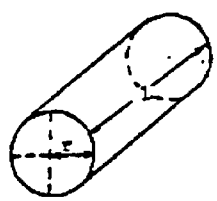
to count the number of full sections and add them together. This can be done instead of treating the whole codend as a single unit. The codend has reinforcing cables, or "expansion straps", around it and "riblines", which are often made of chain, running its length. These limit extreme bulges and allow the amount of fish between each strap to be added as a consistent unit of weight. Count the number of full sections taking into account that the last section often contains a bit more fish, and the first section contains fish which are not compressed. Also, like any mesh bag, when the net is very full, the mesh will expand and bulge and there will be more tonnage per section. Because each net holds a different amount of fish you must make and record measurements every time you estimate a codend. Calculate the volume in cubic meters using the appropriate formula, then multiply the volume by the density, obtained as explained below, to obtain the metric tonnage of the catches.

The deck crew will often want to empty the net as quickly as possible. They may be reluctant to allow an observer time to make the needed measurements. Prepare for this possibility by making sure the captain is aware of your needs, and by being ready to get your measurements as quickly as possible. Be ready to step on deck as soon as the winch cables go slack and know which measurements you need to take. Having one of the deck crew help you regularly will help everyone. The two of you will soon learn to work quickly as a team; measuring will be easier for you and you will finish faster so that the crew can get on with their work. On a net of fifty tons or more, single handed measurements might take ten minutes. With help you should be able to make your measurements much faster. If the deck crew are reluctant to help you, explain your plan to the captain and ask his cooperation.

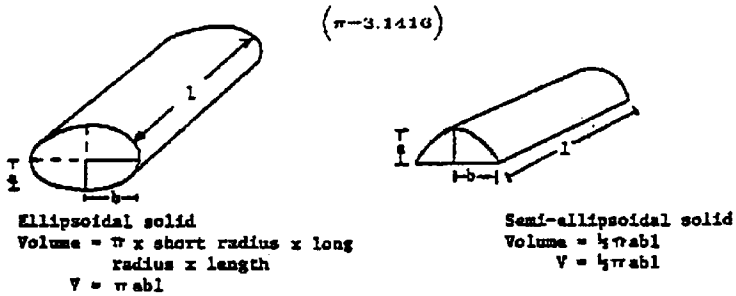
COMMON CODEND SHAPES AND FORMULAS FOR CALCULATING VOLUME



Rectangular solid
Volume = height x width x length
V = hwl



Cylinder
Volume = π x radius^2 x length
V = $\pi r^2 l$

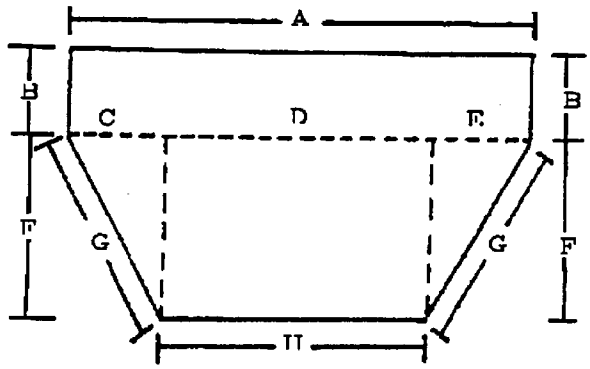


(Allowances can be made for irregular shapes or partially filled portions of the net by the way in which the measurements are taken.)

Observer Estimates by Bin Volume

On some ships, it may be possible to estimate the catch size by the volume of fish in a holding tank or deck bin. Tank or bin volume is preferred over codend volume because the shape doesn't change. Some factors which make it difficult or impossible to use this method are that the tanks may be enclosed such that the depth of fish cannot be determined; the tank may hold fish **and** an indeterminate amount of water; the tank may be too difficult a shape to measure; or tows may be mixed by dumping them in together.

Determine which bin or bins are used to hold unsorted fish. Measure the fish bin to obtain the volume in cubic meters. If the fish bin is shaped like a rectangle or square, it is relatively easy to calculate the volume. Simply multiply the floor area (length x width) by the height of fish. However, many fish bins are irregularly shaped, in which case the floor area of the bin must be considered in separate sections which can be easily measured. The example below shows how one fish bin was separated into shapes easily calculated or measured to obtain floor area.



Useful Formulas You May Need

Area of a circle = πr^2 Circumference = $2\pi r$ (π = 3.1416)
Area of a square or rectangle = length x width
Area of a triangle = 1/2 base x height
For bin floors with a conical shaped depression: Volume of a right angle cone = $1/3\pi r^2 h$

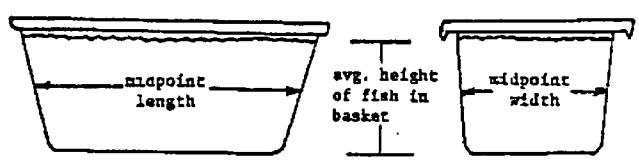
The height of fish in the bin is the third dimension needed to determine volume. If the bin is constructed with boards of equal width, measure the width and use the height of each board to estimate the height of fish in the bin. If this method can't be used, ask if you can use some paint to make height gauges at a few different places on the inside of the bin. To determine an average height of fish, it is best to measure the height of fish at four or more points around the inside of a bin. Be aware of overhead structures which may reduce the volume capacity of a bin when it is filled above a certain point. Height gauges painted on the sides of the tank might also be read from the trawl deck. The area of the fish bin (constant) multiplied by the height of fish from that haul (variable) equals the volume. Volume multiplied by density equals the catch weight.

Density Sampling

Codend or bin volume (in cubic meters) is multiplied by a weight per cubic meter ratio, (termed "density") to obtain a catch weight estimate for that haul. Density is the ratio of mass, or weight, to volume. One cubic meter of fresh water by definition weighs one metric ton. Its **density** then is 1 mt ÷ 1 m^3, or 1.00 mt/m^3. The density of seawater is 1.026 mt/m^3. The density of fish in a fish bin, (their weight per cubic meter of volume) should be close to 1.00 (densities commonly range from .87 - .98). Even though the fish in a codend can be very tightly compacted, observers should not try to compensate for this and must make their own density estimates by sampling for density as explained below.

Density is variable and should be derived from random samples for each sampled haul. Average density values for the day should be calculated and used for catch weight estimates of unsampled hauls. A minimum of 200 kilograms of fish should be used to calculate density. First, obtain the volume of fish in a sampling basket, or some other small container which will hold about 50 kilograms of fish, but is not larger than a cubic meter. That way the fish weight and volume can be accurately determined. If the container sides are sloped slightly use the midpoint width and length measurements. Remember that the midpoint is half the distance from the bottom to the level of fish in the container, not necessarily to the top of the container. It is important to fill all the containers to the same level. It is also important to examine the way that the fish are packed in your container and make sure that it approximately duplicates the way that the fish are packed in the fish bin or codend. Do not compact or smash the fish in an attempt to duplicate the force in the codend. Your resulting density value would be too subjective. A better solution would be to find a larger container or have one built. To calculate the volume of the container, use the following equation:

Midpoint length x height of fish x midpoint width = total volume



After the volume of a container is calculated, you need to obtain the average weight of four or more containers. Be careful to take a random sample of the catch and to fill all your containers consistently to the same level. Then simply divide the average weight of a container of fish by the average volume of fish in a container to calculate the density value for that haul. By using the volume of the fish in the codend or fish bin and the density of your sample fish, you can calculate a total catch weight estimate. Remember:

Volume of fish (m^3) x density (mt/m^3) = weight of fish (mt)

Never argue with the captain about haul weight estimations. His estimated weights in his logbook do not have to equal or even approximate yours. The important thing to remember is that you must record the best estimate of Official Total Catch on the Haul Summary Form, whether it is the captain's estimate or your

observer estimate.

In summary, remember that official total catch must be recorded for every haul (record it to two decimal places). The OTC is the weight that you will use for species composition data. Refer to the list of methods and document the circumstances which lead you to choose the method you used.

SPECIES COMPOSITION OF THE CATCH

In order to study the biology of Central Bering Sea pollock, scientists need to know how much pollock is being caught, what species are caught in association with the pollock (bycatch), and in what relative quantities. Observer species composition data is used for long term stock assessment. The observer should strive for data that is representative of the catch over time by collecting random, unbiased samples of unsorted catch.

DEFINITIONS OF SAMPLING TERMS

Species composition sample - an observer sample of a trawl catch in which the observer identifies, counts and weighs all the individual species, then determines the total weight of the sample.

Sample weight - the weight of catch which was sorted and sampled by the observer.

Whole haul sample - The entire catch was sampled (sorted) by the observer. The sample weight equals the Official Total Catch weight as recorded on the Haul Summary Form.

Partial haul sample - In this sampling method the bycatch organisms are counted and weighed and the numbers and weight of pollock are estimated for a portion of the catch which is less than the whole haul. The observer must be able to make accurate estimates of sample weight.

Weighed sample - In this sampling method every organism in the observer's sample is counted and weighed. The sample weight minimum is 300 kg, the maximum is equal to the OTC weight. Because of the amount of work involved, a weighed sample size is usually smaller than sample sizes obtained using other methods.

Bycatch - any species in the catch other than pollock.

Predominant species - the species which is the most abundant in the catch - not necessarily the pollock.

Sub-sample - the portion of the total observer sample which weighs less than the total sample weight and is processed for a more specific purpose than determining the composition of a haul. For example the observer may choose a sub-sample of pollock for length frequencies.

CRUISE #			VESSEL CODE				
1	2	3	4	5	6	7	8

SPECIES COMPOSITION FORM

OBSERVER NATION 1 2 3 4 5 VESSEL NATION 1 2 3 4 5

OBSERVER NAME EXAMPLE VESSEL NAME _____ PAGE ____ OF ____

YEAR		MONTH		DAY	
9	10	11	12	13	14
		0	8	1	6

SAMPLE TYPE ① 2 3		SAMPLE TYPE 1 ② 3		SAMPLE TYPE 1 2 3	
HAUL #	HAUL WEIGHT (kg)	HAUL #	HAUL WEIGHT (kg)	HAUL #	HAUL WEIGHT (kg)
15 - 17	18 - 25	26 - 28	29 - 36	37 - 39	40 - 47
174	16000.00	176	32300.00		.

	CODE		NUMBER						WEIGHT (kg)	NUMBER						WEIGHT (kg)	NUMBER						WEIGHT (kg)
	48	49	50	51	52	53	54	55	56 - 64	65	66	67	68	69	70	71 - 79	80	81	82	83	84	85	86 - 94
SPECIES NAME	9	9		2	5	0	3	0	16000.00		2	3	1	5	4	18000.00							
T. chalcogramma	3	0		1	1	4	9	2	9282.69		2	2	9	7	3	17920.48							
scyphozoa	0	5		1	3	3	0	7	6455.94					4	7	22.09							
decapoda	0	6				2	1	5	53.76				1	2	3	33.21							
A. ventricosus	1	3					1	4	21.30				.		6	8.4							
L. ditropsis	0	9						1	180.0														
O. tshawytscha	1	7						1	6.31						5	15.82							

COMMENTS

Haul 174 contained large amounts of scyphozoa. Subsample of pollock and scyphozoa weighs 390.3 kg. whole haul pollock and scyphozoa weigh 15738.63kg. 15738.63 − 9282.69 = 6455.94 kg scyphozoa

POLLOCK AVERAGE WEIGHT

WEIGHED 285

WEIGHT 230.2

AVERAGE WT. .80772 kg

scyphozoa: 330 weigh 160.1 kg

other bycatch weighs 261.37 kg

16000.00 − 261.37 kg = 15738.63

pollock + scyphozoa = 15738.63 kg

$\left(\frac{230.2\text{kg}}{390..3\text{kg}}\right)(15738.63\text{kg}) = 9282.69$ kg pollock

POLLOCK AVERAGE WEIGHT

WEIGHED 306

WEIGHT 238.7 kg

AVERAGE WT. .78007 kg

POLLOCK AVERAGE WEIGHT

WEIGHED _____

WEIGHT _____

AVERAGE WT. _____

SPECIES COMPOSITION FORM - INSTRUCTIONS

The Species Composition Form is for recording detailed data for each haul sampled. The most important piece of information on this form is the sample weight. The observer must be careful when deciding how to sample each haul because he must be able to record an accurate sample weight. All the organisms in the sample must be accounted for, and the sum of weights of individual organisms must equal the sample weight.

1. **Record your name and nationality and the name and nationality of your vessel.** Use the same nationality codes from the Haul Summary Form.

2. **Record the date, and haul number.** Remember that the date recorded on the Species Composition Form must be the same as the date on the Haul Summary Form. The date should be the GMT day the trawl began to be hauled in, which is not necessarily the date you sampled it.

3. **Indicate the sampling type** for each sample, using the following codes:
   Codes: 1 - whole haul sample
   2 - partial haul sample
   3 - weighed sample

4. **Record each species in your samples by its scientific name** and the corresponding code from the Species Code List in this section. If you positively identify a species which is not on the list, write down the name and a code will be assigned after you return. If you find a species which you cannot identify, record the name as "Unidentified Fish" on the Species Composition form. Try to preserve it and bring it back with you when your observer trip is finished. If you find more than one unidentified species you must distinguish between them. Also, you should write down a complete description of every species you see using the forms at the end of this section.

5. **You cannot record any species more than once.** Each species may only be listed once for each haul.

6. **All salmon should be listed separately by species** whenever possible.

   Sub-sampling: If large quantities of one of the salmon species are seen, it is permissible to take a random sub-sample of the group and record all of the individuals in the sub-sample by species. Either count or weigh all of the remaining members of the group and apply an average weight (from your sub-sample totals) to get the weight or number, and record these as "salmon unidentified". Make sure that

no individual is recorded twice on the forms. None of the sub-sample should be reported in the larger group of unidentified individuals. (See the example for an illustration of how to record the data in this type of a sub-sample situation.)

7. **Every number must have a weight and every weight must have a number.** All weights should have a well-defined decimal point as the decimal point itself will be keypunched and must be present even if the weights are not carried to a tenth or a hundredth of a kilogram (see the examples of the form). Write in a zero after the decimal point if you do not carry the weights to a tenth or a hundredth of a kilogram. Do not record any weight to more than two decimal places. If all individuals of a species when weighed together weigh much less than .01 kg, do not include the species on this form.

   For occurrences of decomposed fish (species code 26) and/or miscellaneous items (code 27) in your samples, record the total weight of all items, not a weight by species or by individual item, and record the number of items. Decomposed or waste fish are those obviously in a state of decomposition as evidenced by a breakdown of skin and muscle. Decomposing fish must be distinguished from damaged but fresh fish. Damaged fresh fish are not distinguished from undamaged fresh fish of the same species. Miscellaneous items are garbage, debris, fishing gear, wood, seaweed and other such items that may occur in your samples.

8. **Record the sample weight for each sampled haul at the top of each "weight" column, using a well-defined decimal point and trailing zero.** If you whole-haul sampled for the species composition, the sample weight is the same as the official total catch estimate. The sample weight can equal but never exceed the official total catch weight. The sample weight should always be equal to the combined weights of all individuals in your sample.

9. **Record in the space at the bottom of the form, any raw data** that might otherwise be lost because an extrapolated figure is entered on the keypunched portion of the form. The following are examples of the use of the worksheet:

   a) **If more individuals of a species were counted than could be weighed,** record at the bottom of the page the number and weight of the individuals which you were able to weigh, then calculate the average weight. For example, if you were only able to weigh 500 pollock but you counted 2000, you could determine the average weight of the 500 and multiply the average weight by 2000 to obtain the total weight of 2000. Record the total extrapolated weight for all observed fish

on the keypunch part of the form.

Remember: Average weight = weight ÷ number

b) When whole or partial haul sampling for species composition, the **samples for average weight of pollock must be recorded in the worksheet area of the form.** See the Species Composition Form Example and the instructions for "Recording Whole-Haul Sampling..." in the following section on methods.

c) **Individuals whose weight is estimated** can be recorded on the worksheet as in the Form Example for salmon shark.

Note in the comments section the type of sampling you used, number of baskets or other containers taken, density values, and anything unusual about the catch or sampling.

10. **Complete the data entry check (line 99 at the top of each form)** by adding all of the figures in the number column and enter the sum on line 99, columns 50-55, 65-70, and 80-85. Add the weights of all species in the sample and enter them on line 99, columns 56-64, 71-79, and 86-94. Record the Official Total Catch weight, in kilograms, in "Haul wt" columns 18-25, 29-36, and 40-47.

SPECIES COMPOSITION SAMPLING

Determination of the species composition of the catch is one of the high priority duties of an observer. When random sampling, the relative amounts of species in the sample will not necessarily reflect their proportion in the haul. However, from many samples taken within an area, a reflection of the relative species proportions over time should be apparent. **Never** should you "hand-pick" a "representative" sample based on your visual estimate of the composition. Observer's species composition samples must be collected such that every fish or organism in the catch has an equal opportunity of being in the observer's sample. It is up to you to choose a sampling method and devise a sample collection technique which is most appropriate for your vessel situation. Remember, you must have strong sampling data to support any assumptions that form a basis for the rest of your data collection. Your choice of a sampling method must fall under the natural constraints of your available time, energy, and work space as well as consideration of the size of the catch and its diversity. To guide your judgement in choosing a sampling method, please comply with the following additional constraints to ensure proper and accountable data collection.

If you plan to "whole haul" sample in the ship's factory you must

be present on deck as the net is emptied to make sure that you can identify, count and weigh any species which the crew removes on deck. This insures that your sample will include all individuals caught in the haul. You cannot do a "weighed sample" in the factory if the catch has been pre-sorted on deck.

1. Strive for data that is representative of the catch by collecting random, unbiased samples. Believe in the scientific method of random sampling and in the accuracy of it over a long period of time. As a result of reducing your sample size, you may find that a species whose occurrence is infrequent will be over-represented in some of your samples and under-represented in others. Over time and with many samples, the level of occurrence will closely approximate the true value (assuming random samples). Remember that your data will be combined with all other observer data from the Central Bering Sea pollock fishery. It is better to produce accurate data using a small sample size than to have a much larger sample size with inaccurate data.

2. Allocate your time appropriately. Sampling a catch may take several hours. If your ship is hauling more than three catches per day, you should reduce your sampling time by reducing your sample size. This will allow you to sample more hauls.

3. You cannot sample for only one species or group, nor can you leave out any component of the catch.

4. The weight of catch which was sorted by the observer is the "sample weight". You must be present to sort, or directly supervise the sorting, through the entire collection of **all** of every sample. If you see or suspect that the sorting of your sample is not completely thorough, reduce your sample size and/or change your sampling situation until you can be sure that you are getting all the bycatch, allowing for human error. You should adjust your sample size if the fish which are passing by you are too deep or moving too quickly, or you cannot closely watch those assisting you to sort.

5. There can be only one sample weight per haul.

6. The sample is sorted according to species, and the weight and number of individuals for each group is recorded. It is best to count and weigh all of a species sorted from your sample weight, but if you cannot, you must at least count them all and weigh some of them or vice versa. <u>You cannot estimate both the</u>

number and the weight of any species.

METHODS OF SPECIES COMPOSITION SAMPLING

There are three different sampling methods you can use to obtain the necessary data. These methods are **whole haul sampling, partial haul sampling** and **weighed sampling.** The sampling methods you choose are dependent on the diversity and size of the catch, the vessel design and methods for handling the catch, and your time and energy. When one species predominates in the catch and there are very few other species, as in a pollock fishery, it is possible to sample the whole haul to determine composition. The methods will be discussed in detail; it is up to you to decide which method provides the most accurate information in your particular situation, and to devise a sampling scheme which will provide complete species composition data for any sampled haul.

Whole-haul sampling means that the entire unsorted catch passes by you at one point, and you are able to see and remove all bycatch organisms for counting and weighing later. **Partial haul sampling** is a variation of this method in which the observer samples a large portion of the catch and sorts it for bycatch. In a pure pollock fishery, catches will normally be whole or partial haul sampled, which allows for a larger sample. The danger is that accuracy may suffer. **Weighed sampling** is a method in which all organisms are counted and weighed. Although it is an accurate method, is not as useful for large catches of pollock.

Whole-Haul Sampling

Criteria:
- for composition sampling, hauls must be fairly pure, as seen in the pollock fishery. Consider that 1% bycatch in a 50 mt haul is 500 kg.
- you are the first person, or close to the first person sorting the catch.
- the flow of fish is such that you are able to see everything in the haul; either the flow of fish is slow and controlled or the flow of fish is shallow. A processing rate of 25 MT per hour is probably too fast for you to whole haul sample accurately.
- the processing is done in a timely manner. If you are sampling 3-4 hauls in a day, working 3-4 hours per sample is probably not feasible.

When whole-haul sampling, the sample weight is the same as the Official Total Catch weight from the Haul Summary Form, converted to kilograms.

An observer must be present **at all times** to sort or supervise the sorting of bycatch when whole haul sampling. Ideally, the fish flow passing by the observer would be slow and shallow to allow for the complete sorting of catch by the observer alone, but this is not always possible. If you are sorting out bycatch along with the crew, make sure the crew knows that you are sampling (not just helping) and that you need the bycatch set aside for you. Avoid having crew simply count bycatch for you and then rely on their counts multiplied by an average weight. It is too easy for the crew to lose count, and you can't supervise what's going on in their minds. You must have direct <u>visual</u> supervision of anyone helping you to gather sampling data. You are expected to work within the constraints of each sampling situation and produce accurate sampling data. If processing is very slow, the observer may have to change to partial haul sampling if sorting the entire catch will take too much time.

Bycatch species which have been sorted out of the entire catch, must then be counted and weighed. Their numbers and weights are recorded on the Species Composition Form. If the observer is whole haul sampling he should obtain a random sub-sample of the pollock and count and weigh them. Take a minimum of 80 kg of fish for the sub-sample. This sub-sample data must be recorded on the worksheet portion on the bottom of the form and is used to calculate an estimate of the total number of the predominant species:

OTC wt. - total wt. of bycatch = total wt. of pollock
Total wt. of pollock ÷ avg. wt. of pollock = est. no. of pollock

For composition sampling, the sample and sub-sample method above may be expanded to include the situation of whole haul sampling when two species dominate the catch. The extrapolation may not be carried to more than two species. For example, if a majority of the catch is comprised of pollock and jellyfish and there is very little other bycatch, sort the bycatch from the entire haul and identify, count and weigh them. Take a random sub-sample of pollock and jellyfish together and count and weigh them to determine their average weights and their <u>relative</u> percentage by weight. The sub-sample of pollock and jellyfish must weigh a minimum of 200 kg, and the data must be recorded in the worksheet portion of Species Composition Form.

These are the calculations which accompany the Species Composition Form example.

1. Subtract the total combined weight of the bycatch species from the sample weight. The figure you obtain will be the weight, in this example, the <u>combined</u> weight of the <u>two</u> major species in the haul, pollock and jellyfish.

16000.0 kg - 261.37 kg = 15738.63 kg
(sample wt) - (bycatch) = (combined weight of pollock & jellyfish in total catch)

2. Record the numbers and weights of the sub-sampled pollock and jellyfish (used for determining average weights and percentages) in the worksheet part of the form. Divide the total catch weight of pollock and jellyfish by the proportionate weights of the pollock and jellyfish in the sub-samples, so that you obtain the estimated weight of each species in the whole haul.

the sub-sample yielded:
285 pollock = 230.2 kg
+ 330 jellyfish = 160.1 kg
Total sub-sample weight = 390.3 kg

$\frac{\text{kg pollock in sub-sample}}{\text{total sub-sample wt}} = \frac{230.2 \text{ kg}}{390.3 \text{ kg}}$ about 59% pollock by weight

$\frac{\text{kg jellyfish in sub-sample}}{\text{total sub-sample wt}} = \frac{160.1 \text{ kg}}{390.3 \text{ kg}}$ about 41% by weight

3. Next, multiply the combined weight of pollock and jellyfish in the haul by the ratio of the weight of each predominant species over the sub-sample weight.

$\frac{230.2}{390.3} \times 15738.63 = 9282.69$ kg = wt. of pollock in whole haul

$\frac{160.1}{390.3} \times 15738.63 = 6455.94$ kg = wt. of jelly in whole haul

You must now sum the proportioned species weights to make sure that rounding did not result in a sum greater than the pollock and jellyfish weight obtained by subtraction of bycatch from OTC. (9282.69 + 6455.94 = 15738.63)
Record the extrapolated weights on the Species Composition Form in the correct columns.

4. Using the average weights of these species obtained from the sub-sample, calculate the number of individuals each weight represents.

9282.69 kg ÷ $\frac{230.2 \text{ kg}}{285 \text{ pollock}}$ = 11492 estimated number of pollock, when rounded to a whole number.

6455.94 kg ÷ $\frac{160.1 \text{ kg}}{330 \text{ jellyfish}}$ = 13307 estimated number of jellyfish, when rounded to a whole number.

The total weights for pollock and jellyfish, obtained by subtraction and relative percentage, and their estimated total

number would be recorded on the keypunched portion of the Species Composition Form.

Remember, that after you have completed the above calculations all the species weights must still add up exactly to the Official Total Catch weight as expressed in kilograms.

Partial Haul Sampling

Criteria:
- sorting bycatch or prohibited species from the whole haul would be too much to handle or take too long because the catch is large and/or because the processing rate is slow, but you are still able to sample a large portion of the haul.
- the catches are still very pure
- you are the first person or near the first person who sorts the catch
- the flow of fish is such that you are able to see everything in the portion of the haul that you are sampling
- **you are able to get an accurate sample weight** (this will be discussed later in this section - read it carefully)

There may be times when whole haul sampling is not possible; for example, if you are faced with a haul containing large numbers of bycatch species, a very long processing time, very large hauls, or insufficient access to the entire haul. Sampling only a portion of the haul is an alternative. The sampling procedure is the same as when whole-haul sampling, but bycatch is collected from only a portion of the haul and your sample weight is less than the Official Total Catch weight. Visual estimates such as "about 1/2 or 1/4 of the catch" are not allowed. **If you choose to use a partial haul sample method you must report all sample size calculations.** Remember, fish tend to settle into layers by size or species in a bin, so you must try to sample different parts of the bin or hold.

The most accurate, and easiest, way of estimating sample weight is by determining the volume of fish sampled from a bin. This is done by measuring the difference in the height of fish in the bin at the beginning of the sampling period and again at the end of the sampling period. Multiply the difference in the height measurements by the area of the bin and then multiply that volume by the density, to determine the sample weight.

height (m) x floor area (m^2) x density (mt/m^3) = sample size (mt)

Refer to the section on "Observer's Total Catch Estimates" for instructions on measuring the amount of fish in a bin. You cannot use this method if you have not measured or verified the floor area of the bin, if you cannot see into the bin well enough to determine an accurate depth of fish, if there is standing water in the bin sufficient to float the fish, or if unknown

amounts of additional fish are added to the bin during your sampling period.

On some boats the observer may have to work on the trawl deck. If the fish are dumped onto the deck for sorting, the observer might partition off a section of the catch on deck with a board or shovel, and sort, count and/or weigh all the catch in the section. On some boats the fish are dumped into compartments on either side of the trawl deck and the observer can collect his samples from these deck bins. The observer should measure the size of deck bins to determine sample size.

If small containers are used to collect fish on deck for a sample, be very careful to avoid bias in filling the containers. The best way to fill small containers is to "catch" the fish as they are flowing from one place to another by inserting the container into the flow or diverting the flow of fish into the container.

Once the sample has been taken, sort, count and weigh all the bycatch. If you have enough time you should then count and weigh all the pollock. If that is not possible, take a sub-sample of pollock from which you can obtain an average weight and then calculate the number and weight of pollock in your sample. Add together the weights of pollock and all bycatch species to obtain the sample weight.

Weighed Sampling

Criteria:
- you cannot whole or partial haul sample,
- you actually count and weigh all organisms in a portion of the haul and your sample weight is not an estimate

A weighed sample is an unbiased, random selection of organisms which are all counted and weighed. A variety of containers may be used to collect and weigh the sampled catch: baskets, brail nets, deck bins, garbage cans, totes or hoppers. Weighed sample sizes may range from a minimum of 300 kg to a maximum of the Official Total Catch weight.

Some biases to avoid when collecting samples of catch:

1. The heterogeneity of the catch in the net - i.e., some species tend to be found at the head end of the net while other species tend to concentrate at the bottom of the codend. Therefore, samples should be taken from different parts of the trawl.

2. As the fish are dumped into a bin, or as they pass onto a conveyor belt, the physics of fish flow may cause fish to separate by size. Sampling should compensate for this.

3. Note the locations where species sorting or size selection by crew members or by machines takes place - samples must be taken before such sorting takes place.

Since observers must avoid unconscious selection for certain sizes or certain species when obtaining samples, various methods have been used to obtain random, representative samples. On some ships it may be possible to get samples directly from the codend as it is emptied. The observer should get assistance from a crewman on the deck to hold a container into the flow of fish as they fall from the net into a hatch opening in the deck. Another good method is to hold the container where unsorted fish are falling from the holding tank to a conveyor belt, or from one conveyor belt to another. A third technique is to find or design a diverter board for the conveyor belt. This is a board hinged into the side of the conveyor belt trough capable of blocking the fish flow along the conveyor belt. This allows the catch to spill off the conveyor belt into a container. Sometimes the boards of a fish bin can be raised, allowing fish to spill out from a lower layer of fish into a container, but this could be a size selective method.

On factory trawlers it commonly takes several hours for all of the fish to be emptied from the bins to the factory and sometimes you do not have many containers available and/or the sampling space is limited. Therefore it is recommended that you collect only two or three containers at a time and do this at intervals during the haul processing. This allows you to gather your samples effectively from different parts of the catch.

With organisms such as jellyfish it might be easiest to weigh them all together and divide the total species weight by their average weight to obtain an estimate of their number. At least thirty to fifty organisms must be sub-sampled for average weight. However, in a Weighed Sample, the weight of a species group may only be obtained by actually weighing.

Mixing of Hauls

A special sampling problem exists when hauls are being mixed and you must sample after mixing occurs. If this happens, there are at least four possible courses of action:

1) If it is possible to do so, ask the captain or fishing master to keep the hauls separate. If several bins simultaneously empty onto the conveyor belt from which you are sampling, ask the factory manager if he could arrange for only one bin at a time to be emptied while you are sampling.

2) If the fish from two different hauls are thoroughly mixed in the bin before you start sampling, take a larger sample (double the normal size if possible) from the combined hauls and divide

the sample data proportionally by haul weight and record the data as two separate samples. Adjust the species weights as necessary to preserve their actual average weight. Haul by haul information is a convenient and necessary way of dividing up the data, but if the hauls are from the same area, vessel and time period, it is not critical that the fish are attributed to the exact haul in which they were caught.

3) You may observe layering of fish after the mixing of hauls. You possibly could see the difference in new fish versus old fish in freshness and in state of rigor mortis. Noticing this difference can allow you to sample either or both hauls and obtain discrete data.

4) If you are already sampling and a new catch is dumped on top of the one you are working on, finish your sample before any mixing can occur.

BIOLOGICAL DATA COLLECTED FROM SALMON

The following information should be collected from the salmon which occur in your samples:

(a) Species identification - the five species which may be encountered are king, chum, sockeye, pink, or coho.

(b) Sex - determine the sex of each salmon; only vigorous live salmon that have minimal scale loss should not be sexed, but recorded as "unknown" sex. When the observer is not sure of the sex of a salmon or does not have enough time to sex it, the sex should also be recorded as "unknown."

(c) Numbers of salmon - determine numbers by species and sex.

(d) Weight - record the individual weights if scale samples are to be taken; if scale samples are not taken of all fish, obtain the total weight by species and sex for those fish whose scales were not sampled.

(e) Length - the fork length of each salmon found in the sample is recorded to the nearest half centimeter on the Length Frequency Form, (see "Length Frequencies" in a following section). Length measurements are grouped by species and by sex, and are recorded in ascending order.

(f) Scale samples - the purpose of taking scale samples is primarily for confirming the observer's identification of the salmon, therefore, observers should take scale samples of the first 20 salmon of each species identified during the deployment period (regardless of the number of vessels the observer was on). The scale samples and data forms will

also be used for determining the ages of the salmon. Follow the collecting instructions in "Scale Samples and Random Stratified Otolith Samples" in a following section. Do not collect scales from salmon that are not part of your sample unless they were tagged salmon.

(g) Check for missing adipose fin, fins that are clipped, brands, and tags. Salmon with these types of marks may also have been tagged with a coded wire in the snout. Follow the directions in the section on "Tagged Fish."

The observer should seldom have to sub-sample salmon. If time does not allow the observer to gather all of the above information from each fish, numbers and weights by species should be collected from your random sample. If this does not help, reduce your sample size. Then take a random sub-sample for sexed lengths (and watch for tags). Take scale samples from each species identified, as needed.

SPECIES IDENTIFICATION

All fish and invertebrates which occur in your samples must be identified to species whenever possible. There will be very few species other than pollock occurring in the Central Bering Sea fishery. Pictures and descriptions of the expected species will be given to you to help you make your identifications. There is also a form which you should fill out every time you see a different species. You do not need to fill out a description form for pollock. These forms can be kept with your data so that anyone who uses your data will know exactly what species you have included on the Species Composition Form. It is important to fill out these forms if your ship catches a species not included in the provided list.

To verify identifications, each observer should fill out species description forms for the first sighting of any fish or invertebrate which occurs in the samples.

On species composition forms, do not use categories such as "unidentified fish" unless the fish has been mangled to the point at which it is not recognizable. If you have been unable to identify a species, keep the data separate by labeling it, for example, "fish A" or "invertebrate B" and carefully fill out a species description form in complete detail. Collect a specimen to bring back if possible. If you are able to determine their identity later, perhaps with another observer's help, then substitute the species name and code in place of "fish A" or "invertebrate B" on your forms. If you do not get a positive identification on them later, then you must group them under "unidentified fish", or "unidentified invertebrate" on your forms. Remember, on the Species Composition Form a species code may only be listed once for each haul.

SPECIES CODE LIST

CODE	SCIENTIFIC NAME	AMERICAN NAME
01	unidentified fish	
02	unidentified invertebrate	
03	unidentified bird	
04	Vampyromorpha sp.	pelagic octopus
05	Scyphozoa	unidentified jellyfish
06	Decapoda	unidentified squid
07	Gonatopsis borealis	boreopacific gonate squid
08	Gonatopsis makko	mako gonate squid
09	Lamna ditropis	salmon shark
10	Petromyzontidae	unidentified lamprey
11	Lampetra tridentata	Pacific lamprey
12	Myctophidae	lanternfish
13	Aptocyclus ventricosus	smooth lumpsucker
14	Sebastes sp.	unidentified rockfish
15	Sebastes aleutianus	rougheye rockfish
16	Oncorhynchus, sp,	unidentified salmon
17	Oncorhynchus tshawytscha	chinook salmon
18	Oncorhynchus keta	chum salmon
19	Oncorhynchus gorbuscha	pink salmon
20	Oncorhynchus nerka	sockeye salmon
21	Oncorhynchus kisutch	coho salmon
22	Zaprora silenus	prowfish
23	Icosteus aeniqmaticus	ragfish
24	Caristius macropus	manefish
25	Alepisaurus ferox	longnose lancetfish
26	Clupea harenqus pallasi	herring
27	Hippoglossoides elassodon	flathead sole
28	Atheresthes stomias	arrowtooth flounder
29	Gadus macrocephalus	Pacific cod
30	Theragra chalcogramma	walleye pollock
31	decomposed fish	
32	miscellaneous, unidentified (seaweed, garbage, etc.)	

If you have a fish in your sample or samples which is not on this list, write down the scientific name on your forms and leave the species code columns blank. A code will be assigned to the species after you return.

MISCELLANEOUS SPECIES DESCRIPTION FORM

Species Name:_____
Date of Capture:_____
Haul or Delivery Number:_____
Position of Capture (Lat. & Long.):_____
Depth of Capture:_____
Length:_____
Weight:_____

Did you bring back a specimen? Yes No
(Note: If this animal represents a range or depth extension or a record in size, bring it back for species verification.)

This form is to be filled out for the first sighting of all fish and invertebrates keyed out to species. For fish, include counts of all fin rays, standard body measurements, (fork length, head length, snout length, and caudal peduncle length) and any other pertinent measurements.

Examine the fish and record the following characters: (Note: There is variability in fish of the same species, and even between counts on different sides of the same fish. Therefore, counts on both sides might help.)

Dorsal fin spines:_____ _____ _____
Dorsal fin rays:_____ _____ _____
Anal fin rays:_____ _____
Anal fin spines_____ _____
Pectoral fin rays:_____
Pelvic fin spines:_____
Pelvic fin rays:_____
Gill rakers--lower arm:_____
Gill rakers--upper arm:_____
Gill rakers total:_____

List below, the features that led you to decide on this species name. Be detailed in your description, and on the back of this form, make a sketch showing the main features.
If you are not absolutely sure of your identification, bring a specimen back or take a photograph of it.

_____

_____

_____

_____

_____

Draw Specimen on Reverse Side

USEFUL FORMULAS YOU MAY NEED

Number of Product Units x Average Unit Weight = Total Weight of Product

Product Weight ÷ Recovery Rate = Whole or Fresh Weight of fish used to make the product

Product Weight x Conversion Factor = Whole or Fresh Weight of fish used for product

Area of a circle = πr^2 Circumference = $2\pi r$ (π = 3.1416)

Area of a square or rectangle = length x width

Area of a triangle = 1/2 base x height

Volume of a right angle cone = $1/3\pi r^2 h$

LENGTH FREQUENCIES

LENGTH FREQUENCY FORM FOR MEASURED SPECIES

The Length Frequency Form is used for recording the lengths of randomly selected pollock from your samples, and the lengths of all salmon in your samples. **Caution: On this form record only lengths which you actually measured, do not record estimated lengths.**

1. Record your name and nationality and the name and nationality of your ship, as on the Haul Summary Form and the Species Composition Form.

2. Record the date. This should be the same date as on the Haul Summary Form for the haul number. Start each day's measurements on a new side of the two sided form. Use both sides of the page.

3. Record the scientific name and the associated species code from the same code list as used for the Species Composition Form.

4. Record the haul number in columns 17-19. All length frequency data must have a haul number assigned to it.

5. Record lengths of pollock or salmon by sex. If no sex is determined or the immaturity of the species makes sex identification impossible, use code "3" for unknown.
   Codes: 1 - male
   2 - female
   3 - unknown sex

6. The size group is the length measurement to the nearest five millimeters. Lengths from 0-5 mm are rounded down to 0, and lengths from 5-10 mm are rounded down to 5. For example, if the fork length of a fish is 426 mm, it would be recorded as 425 mm on the form. Another fish measuring 453 mm would be recorded as 450 mm.

   Record sequential data horizontally across the form. List lengths from the smallest to the largest within a species/haul/sex designation. Record the size groupings in the shaded columns labeled "Length".

7. The frequency is the number of fish observed in each size group. Include a size group only if there is a frequency of one or more. The frequency is recorded in the columns labeled "Number".

8. Start a new row each time there is a change in sex, haul number, or species, or when there are more than seven sizes

in a group.

9. In the "Sum Of Row" columns 21-24, simply add all of the numbers in the row (size group and frequencies together) and enter the sum. Be sure to check your work by adding it again to verify your sum.

10. Note that more than one species can be recorded per page as long as each species is identified by name and code. Skip a line between species.

11. Note that more than one haul can be recorded per sheet as long as the hauls all ended on the date written at the top of the page. Start each day's measurements on a new side and use both sides of the form.

12. Leading zeros should appear in the month and day only (columns 11 and 13 only, as needed). No leading zeros should be written in species code, haul number, size, or frequency columns.

LENGTH FREQUENCIES OF SALMON

All observers should take length frequencies of all salmon found in each sample except when there are too many salmon to sex, weigh and measure in a reasonable length of time. For sub-sample guidelines, refer to the previous section titled "Biological Data Collected From Salmon". A sub-sample should be a random sample as found in the catch. Do not select a single salmon species for subsampling.

Length frequencies are recorded by species and by sex. Do not use the species code for "unidentified salmon". Cut open salmon to determine the sex unless it is vigorous **and** has minimal (less than 10%) scale loss. For help, see "Sexing Fish" in a later section. Detailed instructions on taking scale samples for salmon follow in the section on scale sampling and Biological Sampling Form.

LENGTH FREQUENCY FORM

PAGE_____ OF_____

CRUISE #			VESSEL CODE					YEAR		MONTH		DAY	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
										0	8	1	6

OBSERVER NATION
1 2 3 4 5

OBSERVER NAME
EXAMPLE

VESSEL NATION
1 2 3 4 5

VESSEL NAME

5 mm SIZE GROUPS:

0-5 mm rounded down to 0 mm
5-10 mm rounded down to 5 mm

SPECIES NAME	SPECIES CODE	HAUL NUMBER	SEX CODE	SUM OF ROW	LENGTH	NUMBER	LENGTH	NUMBER	LENGTH	NUMBER	LENGTH	NUMBER	LENGTH	NUMBER	LENGTH	NUMBER	LENGTH	NUMBER
	15-16	17 - 19	20	21 - 24	25-28	29-31	32-35	36-38	39-42	43-45	46-49	50-52	53-56	57-59	60-63	64-66	67-70	71-73
O. tschawytscha	17	174	1	831	830	1												
O. tschawytscha	17	176	1	701	700	1												
O. tschawytscha	17	176	2	2344	620	1	565	1	575	1	680	1						
T. chalcogramma	30	176	1	2356	320	1	325	1	330	2	335	2	340	1	345	2	350	2
↓	↓	↓	1	2632	355	4	360	4	365	5	370	6	375	7	380	8	385	8
	↓	↓	1	2898	390	9	395	9	400	10	405	9	410	11	415	7	420	8
	30	176	1	1744	425	6	430	4	435	3	440	1						
	30	176	2	2473	330	1	340	1	345	1	350	2	360	1	365	3	370	4
	↓	↓	2	2794	375	6	380	8	385	9	390	9	395	11	400	9	405	12
↓	↓	↓	2	3032	410	10	420	6	425	3	430	2	435	2	440	3	445	1
T. chalcogramma	30	176	2	461	460	1												

LENGTH FREQUENCY SAMPLING METHOD

The length and age data from observer samples will be used to determine the relative abundance of each year-class of pollock. Length frequency data provide information on abundance of fish of each size category while otoliths (ear bones) are read to determine the corresponding age.

All observers are asked to take length frequencies. The fish to be measured may be collected during or after sampling, or from an unsampled haul, as long as they are randomly gathered. You should try to take length frequencies of at least 200 fish every day. The day's length measurements may all be taken during **one** sample period or lengths may be taken from **several** sample periods to ensure that measurements are representative. It is important, however, that no sample is selected on the basis of size.

Length frequencies are taken from fish which are collected in a random, non-size selective manner during your species composition sampling. For example, these may be the same fish which you count and weigh to determine average weight. If you wanted to sample 200 fish for length frequencies and the sample you set aside only has 192 fish, don't collect another eight fish. It is too easy to bias your sample by "picking" them out in an inappropriate manner.

Determine the sex of all the pollock you have set aside for length measurements. Instructions on sex determination follow this section. Separate the fish into containers according to sex. If you are unable to determine the sex of some fish (usually the small ones), separate them into a third group to measure. Their lengths will also need to be recorded and sex code "3" (unknown) recorded.

Next, set up a measuring board, and record the haul number, date, and species name. Observers must keep length frequency data for each tow and each species separate. Record data from different hauls on different length measuring strips.

Take one of the containers of sexed fish. Note whether the fish are male, female or of unknown sex. Position each fish on the measuring strip with jaws closed, snout against the end, dorsal surface against the back, and the fish body flat and straight. Spread the caudal fin with your hand to help determine the fork or midpoint of the fin's posterior margin. Fork length measurements should always be taken, even if the tails are ragged and the exact location of the fork has to be estimated.

With a pencil, place a stroke or punch a hole on the strip in the space where the fork or midpoint of the tail is. If the fork of the tail lies on a line, reposition the fish and check it again. If it is still on the line, record the length in the smaller

(shorter), adjacent length space. After recording a measurement on the strip, some fish may be set aside for otolith and/or scale samples. Refer to "Scale Samples and Otolith Samples" in the following section.

When starting to measure another container of sexed fish, verify their sex and make sure you are recording their lengths on the appropriate part of the strip. At the end of sampling, the number of pencil strokes/hole punches per sex, per length spacing will give the size group's frequency by sex.

BIOLOGICAL SAMPLE FORM INSTRUCTIONS

The Biological Sample Form is used for recording biological information concerning individual fish. It will most often be used in recording the sex, length, and weight of fish from which you have collected scales, otoliths, or other biological structures. It is also used to record pollock maturity. It is the record of associated data which must accompany scales of salmon caught incidentally as well as the otolith collections of pollock which you may have.

1. Record your name and nationality and your vessel's name and nationality, and the date. Start each day's measurements on a new side.

2. Leading zeros should appear in the month and day only (columns 11 and 13) as needed.

3. Record species name, species code, haul number, and sex code for each fish. Use the same species and sex codes as on the Species Composition and Length Frequency forms.

4. Record the specimen type that is being collected:

   Codes - 1 -- otoliths
   2--scales
   3--other structure

5. Record the sampling system that was used: (you will be told which sampling system to use before you go to your ship)

   1--stratified random--This is the most common system for collecting otoliths in the U.S. Observer Program. The fish are obtained from your length frequency samples and a tally sheet is used to ensure that structures are obtained from no more than 5 fish per 5 mm size and sex group.

   2--systematic--In this system, although the fish may be from your length frequency sample, no stratification is made by size and sex. Instead, you may be instructed to take structures from every eighth, tenth, fifteenth (or other) fish to ensure that the fish selected are a random collection from the population at large. Salmon scale samples are an example of this because scale samples are taken from all of the salmon or a random sub-sample of all of the salmon.

6. The specimen number is the identifying number on the vial, envelope, or other container with the specimen. There should not be any duplicate specimen numbers within a species. The specimen numbers should be listed in sequence.

7. It is best if the specimen data are grouped by sex on the form. See the example form.

   All salmon species can have consecutive specimen numbers, but they should be kept separate from the pollock specimen numbers. See the example form.

8. Record the length of the fish to the appropriate 5 mm group.

9. The weight is to be filled out to two decimal places. Add trailing zeros where necessary.

10. If you are requested to record maturity stage, record this in column 35. An appropriate maturity scale for the pollock is included at the end of this section.

11. The space to the right of maturity stage is for the age readers to complete. These spaces should be left blank unless you note something extraordinary about an individual fish, then you may write your comments small enough to allow the age readers to record their remarks also, if necessary.

12. Data from several hauls can be recorded on each page. If more than one haul is recorded per page, the hauls must occur on the same date on the Haul Summary Form. Begin a new side only when all lines are filled, or when you are starting a new day.

13. If you board another ship before completing a collection, you can continue with the same sequence of specimen numbers, but keep separate sets of Biological Sample Forms for the different vessels.

14. If, for some reason, some preservative other that ethyl alcohol was used (such as rubbing alcohol) for preserving otoliths, note the preservative at the top of the first page of each set of the Biological Sample Form.

BIOLOGICAL SAMPLE FORM

OBSERVER NATION (1 2 3 4 5) OBSERVER NAME EXAMPLE PAGE _____ OF _____

VESSEL NATION (1 2 3 4 5) VESSEL NAME _____

CRUISE #			VESSEL CODE					YEAR		MONTH		DAY	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
										0	8	1	6

	SPECIES NAME	SPECIES CODE	HAUL NUMBER	SEX CODE	SPECIMEN NUMBER	SPECIMEN TYPE	SAMPLING SYSTEM	LENGTH	WEIGHT (kg)	MATURITY CODE	REMARKS
		15-16	17 - 19	20	21 - 24	25	26	27 - 30	31 - 34	35	
1	O. tschawytscha	17	174	1	1	2	2	830	6.31		
2			176	1	2	2	2	700	4.30		
3				2	3	2	2	520	2.10		
4				2	4	2	2	565	2.90		
5	↓	↓	↓	2	5	2	2	675	2.90		
6	O. tschawytscha	17	176	2	6	2	2	680	3.62		
7									.		
8	T. chalcogramma	25	176	1	1	1	1	320	.80	2	
9				1	2	1	1	400	.95	2	
10				1	3	1	1	420	.96	3	
11				1	4	1	1	330	.80	2	
12				1	5	1	1	350	.86	2	
13				1	6	1	1	345	.91	2	
14				2	7	1	1	350	.94	1	
15				2	8	1	1	330	.80	2	
16				2	9	1	1	435	.96	2	
17				2	10	1	1	345	.92	2	
18	↓	↓	↓	2	11	1	1	380	.88	3	
19	T. chalcogramma	25	176	2	12	1	1	340	.82	2	
20									.		

HOW TO SEX FISH

Pollock:

You should be able to determine the sex of pollock easily with a little practice. In determining sex, it is generally easiest to start with large, mature fish and work down in size to small, immature specimens. Thoroughly dissect a few pollock and identify the various internal structures so that you know what you are looking for.

The gonads of pollock are found directly above the vent near the top of the visceral cavity. An easy way to find the gonads (with a little practice) is to slit the stomach open near the vent, but do not cut through the vent. Then use your thumb to scoop the viscera out of the visceral cavity. With a little practice, the gonads can be exposed for examination on the back of your thumb.

The ovaries are paired bags or sacs which are typically pink or orange in color and slightly translucent. When immature the sacs may be clear but they can be distinguished from testes or other organs by shape and position. When the ovaries are mature they tend to be bright orange. They will often nearly fill the posterior end of the visceral cavity and you should be able to see the eggs inside the ovaries. The ovary sac may or may not have black and white blotches on it.

The testes look very different from the ovaries. They are always opaque. They are in the same location as the ovaries but when immature, they will only be a thin filament with a tiny ruffled edge that is attached to the vent. In this stage, the testes are very small and must be looked for carefully. As an immature male pollock begins to develop, the lower side of the filament can be seen to have very small and fine convolutions. When immature, the testes will be dark pink due to the ample blood supply. Then, their color turns near white tinted with pink as milt develops. As the fish matures, the lower edge of the testes fills with milt and the convolutions will be thick, opaque and white, filling the inside of the fish.

Salmon:

The gonads of salmon are thin, clear filaments which are found along the top of the visceral cavity just below the backbone. Salmon gonads, unlike other fish, will be found near the anterior (head) end of the visceral cavity.

Sexing salmon is relatively easy. Even very young females produce eggs. To sex the fish find the clear tissue of the gonad and look for the presence or absence of the relatively large, round, orange eggs. If eggs are present then the fish is a female. If eggs are absent then the fish is a male.

COLLECTING OTOLITHS

Many observers will be asked to collect otoliths (ear bones) or other structures from pollock. Each observer will be instructed individually on what to collect and how to collect it. These are general instructions on how to collect otoliths from pollock.

RANDOM STRATIFIED OTOLITH SAMPLING

Otoliths, or fish ear bones, are collected from a stratified sample of the catch for determining age. These are read in a similar manner as tree rings to determine age. The fish from which you take age structures are a sub-sample of those in your length frequency sample. A "random stratified" sample is a sub-sample, chosen according to length, taken from the randomly selected length frequency sample of fish.

A maximum of five pairs of otoliths per sex for each 5 mm length group are to be taken for this type of collection (5 males and 5 females of each size group). Do not be concerned if after completing your collection you do not have a complete set of five pairs of otoliths per sex for each length group that you observed. It is expected that you will have only one or two samples from fish whose lengths are at the extremes of the size range you see. The object of this collection is <u>not</u> to complete the 5/size/sex categories on the tally sheet or to fill all the containers. The object is to obtain age structures from most of the commonly observed length groups in the length frequency collection so that age and length information can be used to evaluate the status of the fish populations.

SYSTEMATIC OTOLITH SAMPLING

If you are requested to collect otoliths using this method, you will be instructed on which fish to collect. The otolith collection will also be a sub-sample of your length-frequency sample. The description of this method can be found in the instructions for filling out the Biological Sample Form.

RECORDING COLLECTION INFORMATION

Otoliths are always collected while taking length-frequency measurements by sex from pollock. After taking the length measurement, if the fish is of a size and sex needed, weigh the fish with a scale. Record weight, sex, and length along with the container number in which the otoliths are placed. The otolith containers are to be filled in numerical order and the sexes should be grouped. A running tally of your otolith collection helps you keep track of what sizes and sex of fish are needed for your collection. A cumulative tally should be maintained for all samples. You will be instructed on how many pairs of pollock otoliths to collect.

Try not to collect more than 20 otolith pairs per day (10 males and 10 females). The collection should be made over the duration of your sampling time on one boat, not in one or two days.

It is very important to identify the otoliths being collected carefully. A mistake in the numbering sequence or procedure used to relate the otoliths to associated biological data can make a collection useless. If you have collected less than 50 otoliths from pollock and you must disembark your vessel and move to a new vessel, you should dump the otoliths which you have already collected and start over on the new ship.

OTOLITH REMOVAL

The largest pair of otoliths are located ventrally and to either side of the brain tissue, about one eye diameter behind the eye in most fishes. Refer to the diagram later in this section. There are three common methods of cutting into a fish's head to remove the pair of otoliths. The easiest method to use in locating and removing otoliths is to make a vertical cut down through the top of the head to the location of the otolith pocket. This point is located by this simple technique: On the side of the fish's head, if you were to make a hypothetical extension of the lateral line and of the curve of the preopercular bone, determine the point at which these two lines would meet. Cut down to that point. Grasp the fish firmly by putting thumb and forefinger into the eye sockets. Use even pressure on the knife as you cut through the bone of the head. Pay attention to the amount of pressure you are required to apply to make this cut. As soon as the cutting gets easier, ease pressure on the knife or you will slice through the otoliths. Stop cutting, put the knife down and break the head open. If you have cut to the correct point, the otolith cavities (one on each side of the brain) will break open and expose the white, calcareous otoliths. They are then easily picked out with forceps and should be wiped clean before storage. Another method is to make a horizontal cut, in an anterior to posterior direction which cuts off the top of the head. This can be done to expose the otolith cavity. This cavity can also be reached by going into the back of the mouth with a pair of forceps or scalpel and piercing up through the roof of the mouth.

Remove the pair of otoliths from each fish. Clean the otoliths by rubbing them between your fingers in water, or on a wet sponge or cloth, to remove slime and tissue, and place them in the container. Place one set of two otoliths in each container. If you use vials with caps, fill the vial half full with a solution of 50% ethyl alcohol and 50% water and cap it. At the end of the measuring period, you should have a complete record of species name, haul number, otolith number, and all corresponding sex, length, and weight data.

SCALE SAMPLES

For salmon the scale is the preferred structure for determining age. Scale samples should be taken from few of each species of salmon present in your samples. Do not collect scales from salmon that are not part of your samples unless they are tagged salmon.

As there is a high chance of obtaining regenerated scales from salmon, try to take samples from both sides of the fish to increase the chance of getting fully formed scales. A minimum of five good scales from each fish must be collected. Place salmon scale samples in small paper envelopes. Try to smear or spread out the scales inside the envelope so that they will not clump together. Then, record the following information on the outside of the envelope: date, haul number, species scientific name, sex, length, weight and scale zone. You can make envelopes with paper and tape or glue.

Directions for collecting scales:

1. Rinse the fish off and/or lightly wipe the area to be sampled with a wet sponge, paper towel, or cloth. This is to minimize contamination of the sample with scales of other fish and to remove slime which can cause scales to rot.

2. Examine the fish and select zone A, B, or other. Record the zone on the envelope. "A" is the preferred zone, "B" is next in preference. Refer to the figure on the next page (Location of Preferred Scale Sampling Zones"). When there are no scales available in either zones A or B (on either side of the fish) then another area may be used.

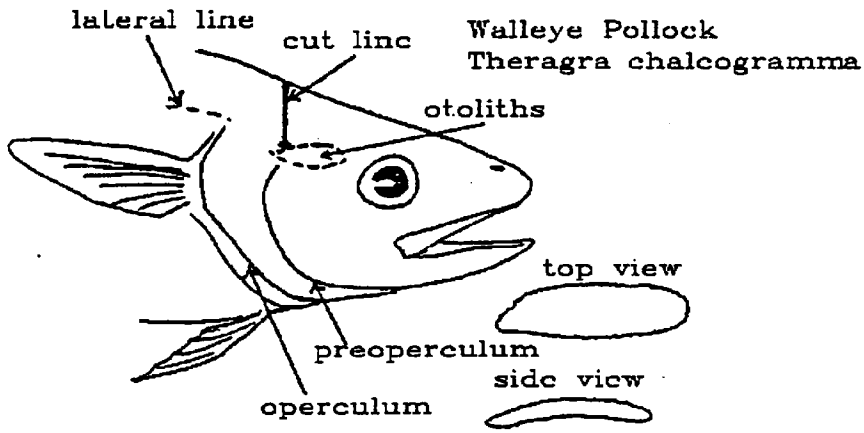
3. Pluck salmon scales out with forceps so as to minimize the amount of accompanying mucus.

4. Wipe off, inside the envelope, 15 to 20 scales that adhere to the forceps. Collect a minimum of five scales. Ensure that samples are clearly labeled and all pertinent information is recorded.

5. Remove excess scales from the instrument before sampling the next fish.

It is recognized that strict adherence to the methods will sometimes be impossible or impractical. Keep a record of the deviations from instructions so that the effect can be evaluated.

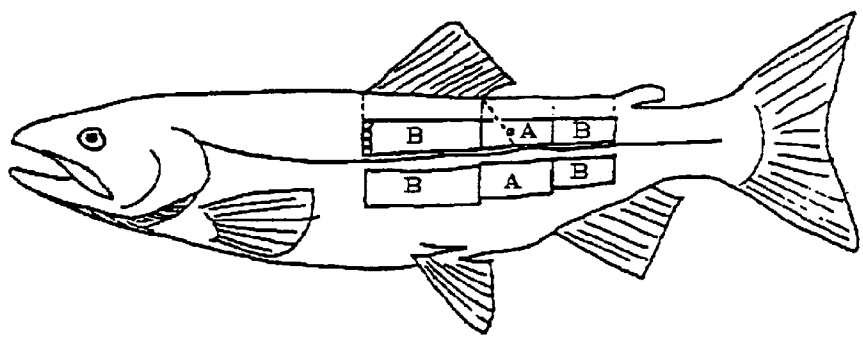
LOCATION OF POLLOCK OTOLITHS



Approximate location of the otoliths (sagittal) and the cut for the removal of otoliths from pollock.

LOCATION OF PREFERRED SCALE SAMPLING ZONES

(Do not take lateral line scales)



Salmon - Follow the diagonal scale row from the posterior insertion of the dorsal fin to the lateral line of either side. Two scale rows up from the lateral line (on the diagonal) are the preferred scales.

POLLOCK MATURITY DESCRIPTION

MALES

Code	Gonad Condition	Description
1	Immature	Testes thread-like, contained within a transparent membrane.
2	Developing	Testes uniformly ribbon-like. Surface of testes appears smooth and uniformly textured.
3	Mature	Testes large and highly convoluted; sperm cannot be extruded. Body wall incision causes gonads to be expelled from opening.
4	Spawning	Testes milk freely or extrude sperm when compressed.
5	Spent	Testes large - but flaccid, watery and bloodshot.

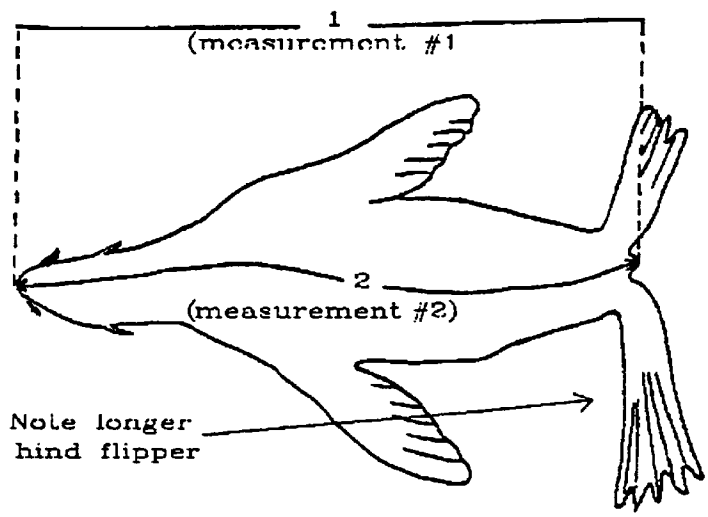
FEMALES

Code	Gonad Condition	Description
1	Immature	Ovaries small, transparent and tapered.
2	Developing	Ovaries tapered, forming two distinct lobes having well developed red blood vessels. Ovaries may be partially granular (some distinct ova).
3	Mature	Ova distinctly visible but cannot be extruded when ovaries are compressed. Ovaries are two large, distinct lobes. Body wall incision causes gonads to be expelled from opening.
4	Spawning	Ova extruded when gonads are compressed or ova are loose in ovaries.
5	Spent	Ovaries are large but flaccid and watery. Ovaries may contain remnants of disintegrated ova and associated structures.

MARINE MAMMAL INCIDENTAL CATCH DATA

Observers should record any marine mammals which were incidentally caught in the fishing nets. Observers must watch the retrieval and dumping of nets that they plan to sample for species composition so they would know whether or not a marine mammal was in the catch. Marine mammals, such as sea lions, tend to congregate around codends being brought in. If a marine mammal is caught in the net, try to collect the following information from the animal: scientific name, sex, length, and position of capture. Is it dead or alive? If alive, is it in poor condition or will it probably survive?

Length Measurements of Seals and Sea Lions



Upper half of the diagram is a Stellar Sea Lion, the lower half a Northern Fur Seal.

Standard Length (measurement #1) is the straight-line distance from the snout to the tip of the tail flesh on the unskinned body, belly up, ideally with the head and vertebral column on a straight line. If rigor mortis has set in, then this measurement probably cannot be taken and measurement #2 should be taken.

Curvilinear Length (measurement #2) is taken when the seal cannot be stretched belly up, as when rigor mortis sets in, or is too heavy to be moved. It is the shortest surface distance from the tip of the tail flesh along the back, belly, or side. Record the type of measurement taken. Seals and Sea Lions are usually

measured with a flexible tape.

Collection of Sea Lion and Fur Seal Teeth

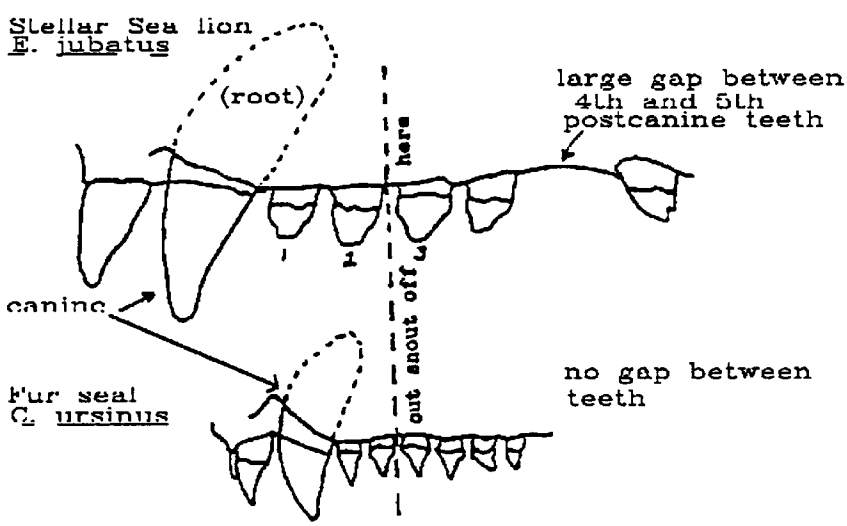
The procedure in collecting a tooth from a seal or a sea lion is as follows:

1. Skin and cut off the snout, taking care not to damage the root of the canine tooth.

2. To insure that the entire canine root is collected, the snout should be cut off between the 2nd and 3rd post canine teeth (see figure).

3. Methods of preservation:
   a. It is probably easiest to triple-bag the specimen and either freeze or salt the snout to preserve it until it can be brought back from sea. Marine mammal scientists will extract the teeth for study.
   b. Alternatively, you may be able to arrange to boil the snout (suggest: outside, on a hot plate, in a non-food pot) until no more flesh remains on the jaws. The jaws can then be stored dry until they're turned in and the teeth will be safely extracted by the Marine Mammal Lab for study.
   c. Or, boil the snout until the tooth can be easily pulled and removed. Do not forcibly twist the tooth when removing; twisting will break the tooth.

4. Do not preserve the snout in formaldehyde.



Outline of sea lion and fur seal teeth.

LOGBOOK ENTRIES

Observers should try to keep a record book for notes and data not included on the forms. Record in this book your catch volume measurements and calculations and density sampling data. Include in the book anything that you may later want to include or summarize in a final report, anything unusual that occurs on the cruise, or anything else that you feel may be of interest. Appropriate entries include:

Why you chose your sampling method,
any changes in sampling procedure,
sampling problems,
calculation of codend or bin dimensions and densities and any other calculations for total catch weight.
Descriptions of how catch estimates were obtained should be recorded here.
If you use the captain's deck estimates as Official Total Catch weight, you should make a table comparing his deck estimates and yours.
Short comments on hauls sampled can go in the "comments" section of the Species Composition Form, but additional explanations on anything unusual, such as a high percentage of jellyfish in a tow, or comments on hauls not sampled, can be entered in the logbook.
Note details on factory processing, or observations on the biology of pollock.

You cannot always rely on your memory of details of events, so it is important that they be written down as soon as possible. If you write a report upon your return, your original notes will be very helpful to you. Any events that are recorded should be in chronological order. Please record your name, vessel name and dates aboard your vessel on the first page inside the logbook.

CHECKING YOUR WORK WHILE AT SEA

When you return from sea you will give all your data to fisheries scientists who will analyze it. They will be studying the biology of pollock and trying to learn more about the quantity of pollock in the Central Bering Sea. The scientists must be able to trust that your data are complete and correct because they may not have the opportunity to discuss your methods with you. There are many things you can do while at sea to make sure that your data are complete and correct.

1. While you are at sea, check your forms on a regular basis. Your manual should be your constant companion while you are doing paperwork. Do not assume that you remember everything that was taught in your training class. Consult your manual and be sure that you are right. Constant checking of your

work will insure that the data you bring back with you will be useful.

2. Use a logbook. In it you will want to keep notes, records, calculations, diagrams, etc. If you plan on writing a report on your observer work you will have all the information you need to write a good report. If you filled out a logbook write your name, your ship's name, observer cruise number, and the dates you were aboard your ship.

3. You will need to have all forms completed when you come back from sea. These are the Haul Summary Form, Species Composition Form, Length Frequency Form and Biological Sample Form.

Other items you may bring back:
- Gear diagrams
- Species Identification forms
- And, if applicable:
  - Salmon scale samples
  - Otolith collections
  - Specimen collection forms
  - Tagged fish forms with fish tags
  - Salmon snouts
  - Sea lion or seal teeth
  - Other biological specimens

Check all of your data forms carefully. If you make one correction be sure to think about what other data might be affected by the change, and carry the correction through to the end. Any change you make on a form may cause changes on other forms, so you must think through all the changes you make.

You should try to check your forms at least once per week. When you do check your data only look at a few pages at a time. This will insure that you maintain your concentration and that you will notice any errors you have made. There is a list at the end of this section of common mistakes observers make when filling out forms. You should read this section and become familiar with the common errors so that you can avoid making them. If you have questions, consult the manual to find the answers. If the manual does not help you, try to contact your lead observer, if you have one.

Remember that if you were on more than one ship that the data from each will need to be kept separate. Do not mix the data together; number the pages in sequence for each vessel - NOT for your entire trip. In addition, changing over to a new year requires new page numbering even if you remain on the same vessel.

Items to Check on All Forms:

- Write your name and ship's name on the first page of each type of form for each ship.
- Make sure the pages are numbered properly with no skipped numbers and no duplicate numbers. If you have a page with data on one side and blank on the other, the blank page may have a page number or not at your discretion.
- Every page must have a cruise number and a vessel code.
- Every time there is a decimal point printed on the page there should be two decimal places written in behind it (the exception to this is the fishing speed on the Haul Summary Form). If there is no decimal point printed on the page then you can record one or two decimal places at your discretion. Remember that only can weights have a decimal place, no other numbers can have a decimal place.
- Be sure that your handwriting is clear and legible. Your data will be studied by people who may not be able to ask you what you have written.

You can help the people who will use your data if you make notes on your forms. Notes should be made any time you have something that is unusual or that might need an explanation. There is space on the top, bottom, and edges of the forms to make notes. Remember not to record notes in data recording areas. The notes you record will enable the people who work with your data to understand what your data means without the need to talk to you. Notes may cover any topic, such as sub-samples, long fishing times, missing data that you could not obtain, and other items.

Haul Summary Form:

The Haul Summary Forms are often the ones with the most problems. Look them over carefully. Question anything that seems incorrect with the ships officers while at sea. Check the Haul Summary Form for:

- An entry for every day, whether fishing or not. For non-fishing days at sea, make a note after the noon position giving the reason why the ship did not fish.
- Haul numbers must be in consecutive order. Record haul number "0" for all non-fishing days.
- There can be no duplicate haul numbers.
- There can be no missing data in a line, except possibly haul speed or observer estimate of total catch.
- There can be no decimals except those printed on the page. The exception is the average speed where you may write in a decimal. Depths must be recorded as whole numbers.
- You must record positions for all hauls and non-fishing days.
- Check that there are no large changes in positions within small amounts of travel time.

There can be no recorded minutes in positions or times larger than 59.
There can be no overlapping "nets at depth" and "begin retrieval" times.
Retrieval times of 0000 GMT are attributed to the next day.
An official total catch must be recorded for every haul.

Species Composition Form:

Be sure that there are:
The correct dates from the Haul Summary Form for the haul numbers sampled.
Species names which match your species codes.
No duplicate species codes.
Weights for every number of fish and a number of fish for every weight listed.
At least one decimal place behind a distinct decimal point for every weight.
Haul weights in kg, sample and species weights in kg.
Necessary calculations and sub-sample data recorded at the bottom of the page.
Data recording check sums at the column tops.

Length Frequency Form:

On this form there must be:
The correct date from the Haul Summary Form for the haul numbers recorded.
Matching species codes to species names.
Species name, species code, sex and haul number for every line of data.
No species with a greater total number listed than is on the Species Composition Form in whole haul sampled data.
No decimal places.
"Sum of Row" filled out for each line.
Lengths recorded in ascending order. No lengths with a frequency of zero.
Sex codes recorded for every species, on every line.

Biological Sample Form:
Check each page for:
Weights and lengths that are in relation to each other.
All specimens have a species name, species code, haul number, sex code, a specimen number, a sex, specimen type, sampling system, length, and a weight.
Each species must be grouped separately on the page.
No duplicate specimen numbers for the same species.
Lengths must also be recorded on the Length Frequency Form.

Cross Checking:

A very important part of checking your data is cross checking one form to other forms that have the same data. Make sure that no hauls are listed on different days on the different forms. The haul date must always be the day when the net was brought on board the ship, not necessarily on the day when you did the work.

If you have salmon in your samples you will need to match the weight data on the Biological Sample Form to the weights on the Species Composition Form.

The lengths on your Biological Sample Form should match lengths on your Length Frequency Form for the same species in the same haul. All of the lengths on the Biological Sample Form must be present on the Length Frequency Form.

If you took otoliths be sure that the haul numbers for the otolith collection correspond to the hauls from which you recorded lengths on your Length Frequency Form.

Reports:

You may choose to write a report of your work as an observer, or you may be required to do so. Reports are a written synopsis of your activities at sea. They should be complete with good detail and be easy to follow. One of the main reasons for writing a report is for the people who use your data. They will be able to understand your methods of data collection without talking to you.

If you do write a report there are several topics you should include. The most important topic is how you performed your sampling, and why you chose to sample in that manner. Another important topic is how you decided on the Official Total Catch. If you used the Captain's estimate explain why you felt his estimate was better than yours. Explain how you obtained your Observer Estimate. If you were unable to make any catch estimates you must also explain why. You can also include information on how the ship fished, what products it made from the fish, and how much the captain and crew helped you, or anything which made it difficult for you to do your job.

THE MOST COMMON MISTAKES ON DATA FORMS

Haul Summary Form:

1. Latitude, longitude, or nets at depth/begin retrieval time recorded with greater than 60 minutes.
2. Writing "2400" for midnight instead of "0000".
3. A haul retrieved at 0000 attributed to the previous day.
4. Not recording the GMT noon position under "Haul Position" on non-fishing days.
5. Overlapping haul times, for example recording a "nets at depth" time which is earlier than the "begin retrieval" time for the previous haul.
6. Recording catch weight to other than two decimal places.
7. Large changes in position which would not be possible during the time recorded.
8. Leaving haul number blank on non-fishing days is incorrect; record "0".
9. You should always record positions, do not leave the position columns blank. If you don't have a position for a haul you should look at the fishing log and find the position, or if there is no position recorded, interpolate one from the positions before and after the missing one.

Species Composition Form:

1. Numbers and/or weights don't add up correctly, do check your math.
2. Species code listed without data accompanying it.
3. Species code doesn't match the recorded scientific name.
4. Decimal point not included in every recorded weight.
5. A weight listed without a number.
6. Recording weights to greater than two decimal places.
7. Haul number doesn't match the date as recorded on Haul Summary Form.
8. Whole-haul sample weight doesn't match the Haul Summary Form figure for Official Total Catch.
9. Recording a fish species that is not on the species code list. Bring back a specimen for verification if this happens.

Length Frequency Form:

1. Data not recorded in haul number order.
2. Summations incorrect. Check and double-check your math.
3. Reversing the size group and the frequency.
4. Haul numbers and dates don't match the Haul Summary Form.
5. Never record estimated lengths on the Length Frequency Form.

Biological Sample Form:

1. Not writing weights out to two decimal places. Do include trailing zeros.
2. Not grouping sexes together.
3. Not separating the otolith collections taken on different boats. (See "General Instructions for Data Forms" section in

your manual.)

4. Duplicate otolith or scale number within one species collection.
5. An otolith or scale number is skipped without any note as to why.

TAGGED FISH

Collecting and returning tags is an important way to help fishery research. If you should find a tagged fish while you are sampling, or if a crew member brings you a tagged fish, return the tag, along with all pertinent information, with your data at the end of your cruise. Tags from cod, pollock, and other fish will then be forwarded to the appropriate tagging agency. Pertinent information should normally include:

1. Tag or tag serial number.
2. Scale and/or otoliths for age determination.
3. Fish length (in mm if possible).
4. Fish weight (in gm if possible).
5. Sex and maturity of gonads (immature, mature, spawning).
6. General appearance (poor body condition, good body condition).
7. Condition of tagging wound (healthy healed tissue, open wound, etc.).
8. Time and date of capture (GMT).
9. Capture location (latitude and longitude).
10. Capture depth.

Tags are usually located on the dorsal surface of the fish, or on the gill cover. Tags can be of the anchor, spaghetti, or modified disk variety. Some fish may be tagged twice.

Some agencies tag salmon by inserting a coded wire into the snout of fingerling salmon. These wire-tagged salmon are marked by clipping their adipose fins. If you find a salmon missing an adipose fin, check to see whether it is missing any other fins, collect a scale sample, record the important data, and in addition, weigh the gonads. Remove the snout by cutting well behind the eye, place the snout in salt, and seal it in a plastic bag. After a few days, drain off any accumulated liquid and re-salt the snout. Repeat the draining and re-salting as needed.

HOW TO COLLECT FISH

You may be asked to collect specimens of various fish, or you may need to bring home a fish which you can't identify. Keep in mind that a large frozen specimen or a specimen collection becomes a piece of luggage, so limit the size to what you can handle. Freeze the fish quickly after deciding to collect it. Lay the fish flat and straight to freeze it. Make an identifying label and put it with (in) the fish before freezing. Fill out a Specimen Collection Form and keep that with your paperwork. When the fish is frozen, glaze and reglaze it with water two or three times. When you prepare to leave your ship, pad and package it well. While in transit do your best to keep it frozen.

SPECIMEN COLLECTION FORM

Collector:_____ Cruise No.:_____
Vessel Code:_____

Date:_____ Vessel Name:_____

Haul No.:_____ Lat. & Long.: _____

Depth:_____(meters) Water Temp.: _____(degrees C.)

Collector's Identification:
_____

Length: _____(cm) Weight:_____(kg)

Notes on <u>in vivo</u> coloration, unusual scale patterns or spines:

_____

_____

_____

Sketch if necessary:

Identification confirmed by: _____
Date:_____

Common Name:_____

Scientific Name:_____

Comments:_____

_____

_____