CRAB SURVEY QUICK GUIDE

For detailed method instructions and information about crabs check out the full manual. Always review the full manual before you go out if you haven't done a survey in a while.

CRAB SURVEY EQUIPMENT CHECK-LIST

- ☐ Crab Traps
- ☐ Bait and Bait Canisters
- ☐ Marker Buoys
- ☐ Calipers
- ☐ Data sheets
- ☐ Tablet
- ☐ Rope and line snaps
- ☐ Pens, pencils, permanent marker
- ☐ Field notebook and notepaper Buckets
- ☐ Depth sounder and/or chart plotter
- ☐ Digital camera
- ☐ GPS or compass
- ☐ Flagging tape for labelling traps
- ☐ Repair kit
- ☐ First aid kit

PRE-FIELD DESIGN CHECKLIST

- Do you have all necessary permits and licenses?
- Have you decided what area you will be sampling?
- How many traps you are going to set? Are you going to set traps as singles or in strings?

STEP 1 – SETTING TRAPS

- Check that the marker buoys have name and phone number of the crew leader
- Check that all traps are numbered
- Record the date and time of when traps were set
- Fill in all other applicable fields of the header form

STEP 2 – RETRIEVING TRAPS

- Retrieve traps after at least 16 hours of soak time
- Keep track of trap numbers; empty trap contents into bucket labelled with corresponding trap number
- Fill in remaining fields of the header form

STEP 3 – RECORDING CRAB BIOLOGICAL INFORMATION

- Work in teams of two – one sampler, one coder
- Record all crab biological data. (Refer to the DFO Crab Manual for codes and descriptions):
  - Species (Dungeness, Red Rock, etc.)
  - Sex
  - Shell Condition
  - Injuries
  - Mating Marks
  - Observations
  - Carapace Width
  - Weight (optional)

- Record any by-catch information if applicable
- Store completed data forms or tablet in a safe place

IMPORTANT LINKS

Marine Weather – Government of Canada - https://weather.gc.ca/marine/index_e.html

Tide Levels – Fisheries and Oceans Canada - http://www.tides.gc.ca/eng/find/region/1

VHF MARINE CHANNELS

Distress, Safety and Calling – Channel 16 or Transmitting Frequency 156.800

Continuous Marine Broadcast (English) – Channel 21 or Transmitting Frequency 161.650

Crab Survey Manual

HA-MA-YAS STEWARDSHIP

Nanwakolas Council
1441 16th Ave
Campbell River, BC V9W 2E4
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FAX: (250) 286-7222

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INTRODUCTION

This manual outlines the methods for doing standardized crab surveys to track crab biology as well as population trends. The methods and collection standards in this field manual have been adapted from the Department of Fisheries and Oceans' (DFO's) document titled "*A Manual for Dungeness Crab Surveys in British Columbia*" (Dunham et al. 2011), from here-forward referred to as the "DFO Crab Manual". The DFO Crab Manual provides standardized sampling techniques so that crab data collected throughout the BC coast can be compared between different locations and different time periods.

WHAT SPECIES ARE MOST COMMONLY HARVESTED?

The most common crab species harvested on the BC coast, commercially, recreationally or traditionally is the Dungeness crab (*Metacarcinus magister*). The Red Rock crab (*Cancer productus*) is also harvested on the BC coast, but to a lesser extent than Dungeness.

DUNGENESS CRAB

The Dungeness crab is a medium-to-large sized crab with a carapace (shell body) width of up to 250mm (25 cm or 10 inches) at the widest point. The shell is uneven with sharp teeth or spines on the front edge and no teeth or spines on the rear or back edge. The shell and walking legs are grey-brown to purple in colour with yellow or whitish pits. The walking legs are usually broad and flat. The pincers are also grey-brown to purple with light-coloured tips. These crabs like sand and mud bottoms (substrates) in eelgrass beds and they are found intertidal to a maximum depth of 225m (750 feet). Legal size limit is a carapace width of 165mm from point-to-point.

Dungeness Crab.

(Image courtesy of http://www.farm-2-market.com/fish-seafood/crab/)

RED ROCK CRAB

The Red Rock crab is a medium-sized crab with a shell (carapace) width of up to 200mm (20 cm or 8inches) at the widest point. The shell surface is uneven with shallow, rounded teeth along the front edge and one tooth on the back edge. The shell and walking legs are dark red with dark red tips on the pincers. Rock crabs are found on gravel and rocky bottoms in eelgrass beds and in the intertidal area to a maximum depth of 78m (260 feet). The legal size limit is 115mm at the widest point of the shell.

Photo 2. Red Rock crab.

(Image courtesy of http://albernicharters.com/target-species/red-rock-crab-bamfield)

WHY CONDUCT CRAB SURVEYS?

Crab stock assessment surveys provide valuable information on relative abundance of crabs; moult periods, and potential environmental impacts. This data can then be used in management decisions related to harvest limits, harvest allocation and possible area closures. Crab surveys can be done to check out new areas for harvest where don't know much about crab presence. Crab stock assessments have been done by several First Nations groups with FSC fisheries in order to better understand relative abundance, reproductive periods, soft-shell periods and potential impacts.

WHAT IS STANDARDIZED SAMPLING AND WHY SHOULD YOU USE IT?

The methods in this manual are close to those in Fisheries and Oceans Canada's "*A Manual for Dungeness Crab Surveys in British Columbia*". In the DFO manual there is a **standardized method** for traps, bait and soak **so that data collected** throughout the BC coast **can be compared between**

different locations and different periods of time. Using the DFO standard for sampling gear, soak time, trap spacing, etc. will allow for your data to be comparable to other crab surveys using the same DFO standard. If trap type, bait, soak times, etc. differ between crab surveys, then the results are not able to be compared directly. It is recommended that First Nations groups conduct crab surveys using the DFO standard so that results of the surveys can be comparted to surveys at other locations.

SURVEY GOALS AND OBJECTIVES: BEFORE YOU GO INTO THE FIELD

PERMITTING AND LICENSING

Before doing any fish sampling for experimental, scientific or educational purposes, you need a valid Scientific License issued by Fisheries and Oceans Canada. I can take up to 30 days to get the permit so apply for the permit well before you want to do the work.

More information on scientific permitting can be found online at http://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/sci/index-eng.html.

The application form for getting a scientific license can be found at http://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/sci/licence-sci-permis-eng.pdf.

Note – Regardless of whether or not you are keeping samples (i.e. doing "destructive sampling" where the crabs are killed) it is best to have a valid scientific license while doing any fish sampling.

SURVEY DESIGN

Crab survey design depend on the size of the survey area and the amount of resources (i.e. traps, gear, budget, etc.) that you have. Surveys may be **synoptic** or **exploratory**.

- **Synoptic** surveys assess an area that experiences ongoing fishing and the aspects of the fishery are already known.
- **Exploratory** surveys are used to learn about an areas crab population where not much is known.

Often crab surveys are done to determine the relative abundance of crabs in an area. But they can also be done to learn about average size, moulting patterns, injury rates, upcoming recruitment (survival of young) and long term population trends. Groups deciding to begin crab surveys for an area should review *Section 3.0 – Directed Assessments*, *Sub-Sections 4.1 – Survey Objectives* and *4.3 – Survey Design* in the DFO Crab Manual. Clear survey goals will help with survey design.

SITE SELECTION

It is important to decide on your **survey area** before starting the survey. The size of the survey area may depend on the number of traps, people, time and budget available. In general, selecting a site will depend on existing **local and traditional knowledge** of crab fishing activity or identifying new areas with **good crab habitat**.

- **Local and traditional knowledge –** Local resources where you can ask or look include your band's fisheries staff, your community marine plan or the Ha-ma-yas Plan, North Vancouver Island Marine Plan, elders, knowledge keepers, harvesters and others that spend a lot of time on the water. The local DFO office or commercial or recreational crab fishers are other sources. **Synoptic** surveys will usually rely on local knowledge for site selection.
- **Identifying suitable crab habitat –** this method requires that surveyors know how to identify good potential crab habitat (sand and mud substrate, eelgrass beds, and depths ranging from 0 m to 225 m) and can locate these areas by studying hydrographic charts and/or being out on the water. **Exploratory** surveys will often use charts and maps in combination with surveys who can find good habitat.

TRAP COVERAGE

The number of traps needed to be set in an area partly depends on the number of traps available and crew size. For more information on laying out traps and survey design, see *Sub-Section 4.3 – Survey Design* in the DFO Crab Manual. In general, the traps should be **placed evenly throughout the whole survey area** where there are sand and mud substrates, eelgrass beds, and depths ranging from 0m to 225m. The survey should avoid areas with poor habitat like rocky areas). Planning trapping coverage and site selection will benefit from maps or Geographic Information Systems (GIS) that have the information about depth and substrates. Traps may be set as **singles** or in **string**.

- **Singles** –Often used in shallow areas with depths up to 15 m; each trap is tied to single line and marker buoy. It is recommended to set the traps 100m apart for single traps.
- **Strings** – Usually set in water deeper than 20m. Multiple traps are clipped to a single ground line anchored to the bottom of the ocean attached to one or two marker buoys. It is recommended that groups of traps set in strings should be spaced about 40m apart along the ground line.

See *Sub-Section 5.2 – Single Buoys or Ground Lines* in the DFO Crab Manual for more information on trap spacing and coverage.

A single trap being deployed on a single line attached to a marker buoy.

SAMPLING FREQUENCY

Like deciding on the survey area, sampling rate depends on the purpose of the survey as well as resources such as budget and personnel. In general, surveys should be done **multiple times a year** over several years in order to develop a solid baseline of information. Gathering information on peak numbers and soft shell periods is useful; therefore, some sampling should be done during moult periods.

HOW MANY CRABS TO COLLECT?

A good number for a sampling event is **200** individual crabs. When in doubt, more is always better. Collecting enough crabs is key to getting a good picture of size and sex categories, moult timing, etc.

TIP – If samples are only returning one size or sex category of crabs, you should increase the sample area o capture representatives from the whole population.

FIELD METHODS

Once you have completed your survey design; laid out your survey area and determined the how often you should sample, it is time to do your field sampling work. The field methods follow three main steps:

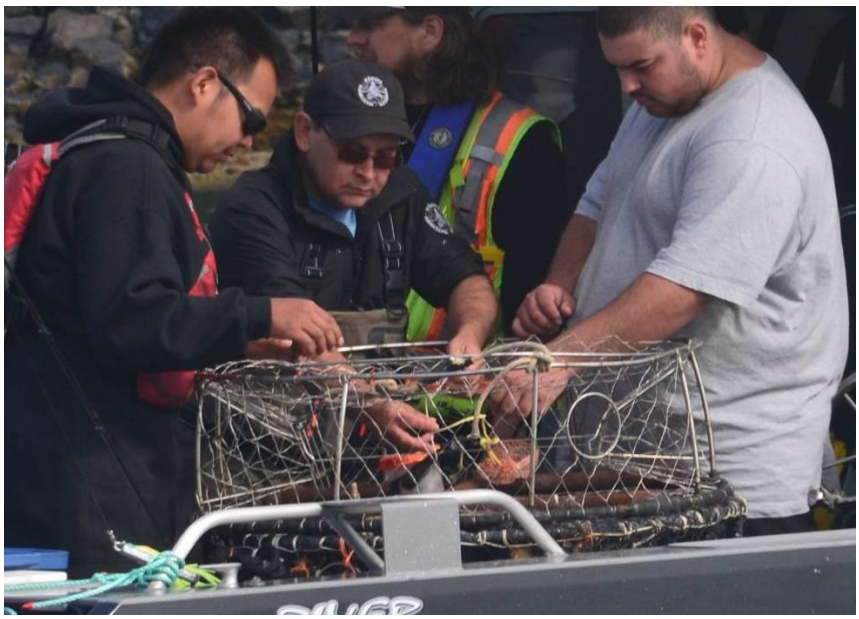
- **Baiting and setting the traps** – begin filling out the header form
- **Picking up the traps and collecting the crabs** – complete filling out the header form
- **Recording crab biological information –** filling out the crab biological data form

Before doing your field work, you will need the right sampling tools and field equipment.

FIELD EQUIPMENT AND SAMPLING GEAR

Crab surveys require a lot of sampling gear in addition to good boat for the job. A reliable vessel is needed to set and pick up a reasonable number of crab traps. In addition to a boat, the following gear is required and should be considered a standard for any and all crab surveys:

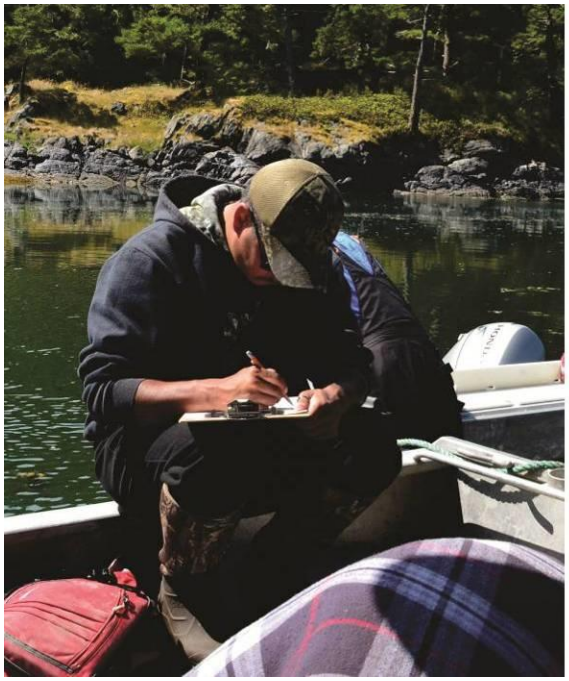
- **Crab traps** – 20 to 100 traps depending on the size of boat and budget of the program. It is standard to use circular stainless steel traps 90cm (36 inches) in diameter and 26cm (10 inches) in height with a 6cm (2.5 inch) mesh size. A biodegradable escape that will break down in the water, such as a rot cord, is recommended.

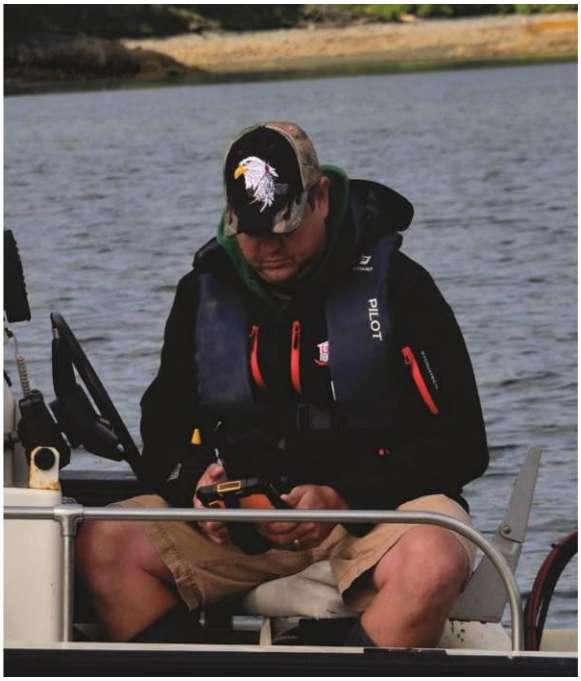


A circular crab trap with openings across from each other and stainless steel mesh.

- **Bait canisters**

- **Bait –** the standard is two large herring ripped in half.
- **Marker buoys** - with the name and phone number of the survey crew leader
- **Vernier calipers –** 300mm stainless steel or other saltwater safe material
- **Data-sheets** –Header forms, crab biological data forms, trap by-catch data forms; crews should have several copies of these forms printed on waterproof paper ahead of time, even if you have them on the cybertracker. Pencils work in rain or sun.





Data may be recorded on forms printed on waterproof paper or by entering the information in the cybertracker.

Other field equipment that is not required, but is strongly recommended and will make conducting crab surveys much easier are:

- Line snaps (metal clips to attach traps to lines)
- Rope (for ground lines and single float lines)
- Digital field scale
- Pens and notepaper
- Depth sounder and/or chart plotter
- Buckets
- Digital camera
- GPS

- Compass
- Flagging tape for numbering and labeling traps
- Repair kit – twine, wire, pliers, zap-straps, spare snaps, spare bait canisters, etc.

The amount of sampling gear required to properly conduct a crab survey requires a safe boat that can hold all the gear.

STEP 1 - BAITING AND SETTING THE TRAPS

This step is important to follow so your results can be compared to other surveys. Standardized fishing procedures are in *Sub-Section 5.3 – DFO Standardized Fishing* of the DFO Crab Manual and are as follows:

- **Trap** - A commercial style circular trap with a diameter of 90cm (36 inches), height of 26cm (10 inches) and 6cm (2.5 inches) stainless steel mesh

  TIP – Whether the traps are set individually or in a string, each trap should be labeled and numbered in order to keep track of how many traps were set and how many traps were retrieved.

- **Bait –** Two large herring ripped in half
- **Bait Canister** - A suspended canister tied in so that it doesn't touch the ground while it is fishing. The canister needs to be punched with tiny 1mm holes so that crabs and smaller animals with shells can't eat the bait but can smell it.

- **Soak Time** - overnight between 16 and 28 hours; 24 hours is best.

More information and details about using standardized sampling gear can be found in *Section 5.0 – Fishing Gear Information* of the DFO Crab Manual.

FILLING OUT THE HEADER FORM

Fill in the fields within a **header form** for the sampling event. The header form records the soak time, the lat-long coordinates of the traps or string of traps, geographic location, DFO Management Area and Sub-Area, weather conditions and other important comments. This form contains fields for the date and time the traps were set and the date and time they were retrieved, therefore, some information will remain blank on this form until the traps are picked up.

See Appendix 1 for a Header Form example and explanation of Header Form Fields and Codes.

STEP 2 - RETRIEVING THE TRAPS AND COLLECTING CRABS

Once the traps have been left to soak in the water for the full amount of time (usually 24 hours), they can be picked up by hand or by using a hydraulic line hauler and davit system.

Retrieving a trap that has been left to soak overnight for a 24 hour period.

As each trap is pulled onto the boat, everything in it should be put in a plastic tote or bucket labeled with the trap number.

Crabs should be removed from the trap and placed in a tote or bucket labeled with the same trap number. Note the pink flagging tape marked with the trap number.

Fill out the rest of the blank fields on the Header Form that was started the day before when the traps were set.

STEP 3 - RECORDING CRAB BIOLOGICAL INFORMATION

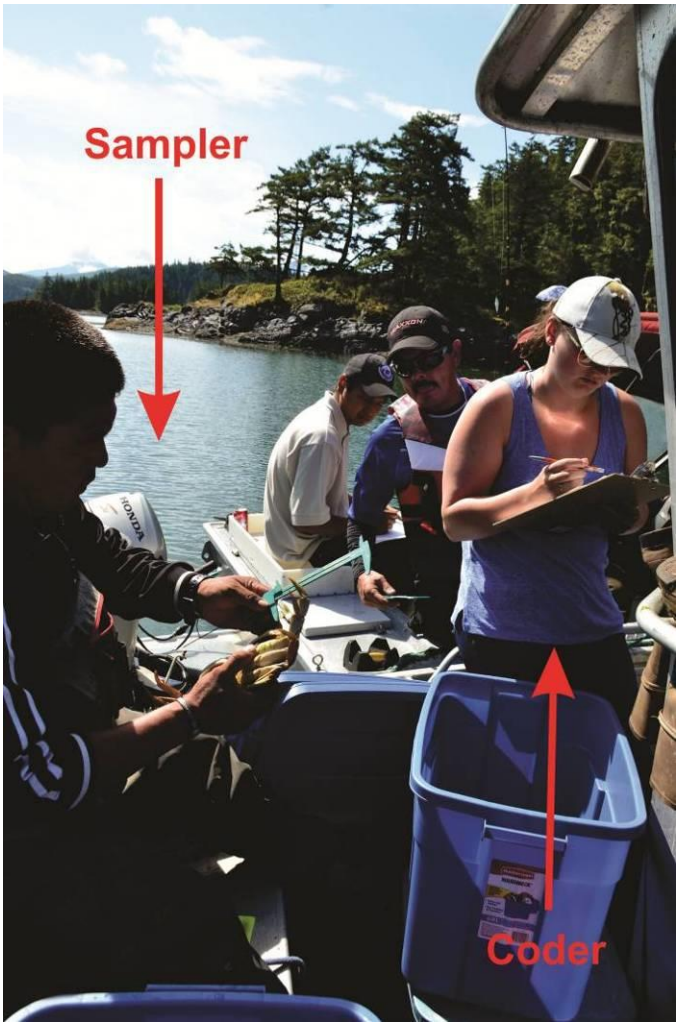
SAMPLING AND CODING

When writing down the crab biological information it is important to use the coding standard for coastal BC, so that the data is easy to compare to and be read by other crab surveyors.

TIP – When filling in the Biological Data Form, you do not need to know all of the codes for the fields; but, it is a good idea to know the codes you will use the most and try to learn those ones. It will make your job easier and faster. You also have a sheet with you with all the codes.

Recording crab data is best with two people, the **sampler** and the **coder**.

- **Sampler** – the person measuring and assessing the crabs
- **Coder –** the person writing down the information



Collecting crab biological data needs a sampler and a coder to work together.

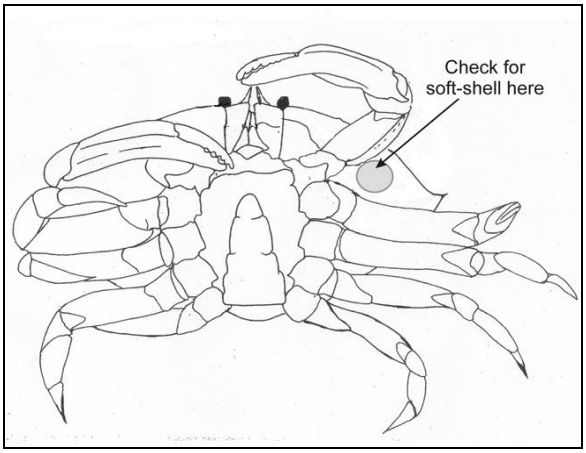
HOW TO RECORD THE DATA

Biological data should be recorded onto a data form printed on waterproof paper or a digital data form on a cybertracker or other computer. The following fields should be included on all forms for recording crab biological data:

- **Species** – You will need to be able to identify a Dungeness crab and tell it from other species. If you are new to doing crab surveys and need some help, then carry a field guide with you. It is best if one person on the team has experience.
- **Sex** – Male and female crabs are easily identified by turning the crab over and looking at their abdomen. Male crabs (sex code 1 in the data form) will have abdominal plates in the shape of a "lighthouse" (A) while females (sex code 2 in the data form) will have abdominal plates in the shape of an "igloo" (B). Egg bound females (sex code 3) will have a large brightly coloured (usually yellow or orange) egg mass (C) while a female in the process of releasing eggs (sex code 4) will have some of a dark brown egg mass (D) and some eggs still stuck to the abdomen.

Images for C and D courtesy of the DFO Crab Manual

- **Shell Condition and Age –** This is an estimate of the stage of crab between moults based on the softness and flexibility of the shell, signs of body wear and the presence of barnacles and other organisms. The softness of the shell is assessed by pushing your thumb on underside of the shell right behind the claw (see example below). Body wear and the presence of barnacles are assessed by looking at the crab.



Refer to Section 6.3 – Shell Condition and Age in the DFO Crab Manual for more information on classifying shell condition and age.

Codes for shell condition and age are provided in Appendix 2.

- **Injuries –** Fill in the injury field with the right code if there are any injuries. There are 9 codes in total provided in Appendix 2. Note – **recent** limb losses which sometimes occurs during the sampling are not recorded.

  Refer to Section 6.4 – Injuries in the DFO Crab Manual for more information on identifying injuries on crabs.

  Codes for injuries are provided in Appendix 2.

- **Mating Marks –** Male Dungeness crabs may have pale scratches on the inside of their claws that occur during the mating embrace. Old marks will be yellow, new marks will be white.

  Refer to Section 6.5 – Mating Marks in the DFO Manual for more information on identifying mating marks on male crabs

- **Observations –** Record anything else of note observed on the crab.

  Codes for various observations are provided in Appendix 2.

- **Carapace width –** The carapace width is measured at the widest point of the carapace, ***NOT*** including the spines; this width is referred to as "**notch** width" and is measured in millimeters. This differs from the width used to regulate the commercial, recreational and aboriginal fisheries where the overall width, ***including*** the spines, is measured; also known as "**point**" width. Notch width is the only required width measurement when recording crab biological data; however, point width can be recorded as well. 300mm vernier calipers work well to measure notch-width.

Measuring the carapace width from a Dungeness crab

- **Weight (not required) –** Weight is an optional measurement. If it is done should be measured as soon after capture as possible and on a stable surface. The units on the scale should be set to grams.

STORING THE DATA

Once the crew has finished sampling, the data should be stored and secured in a safe place. To avoid losing data after it has been collected:

- **Make copies** – If you have recorded the data on waterproof paper you can scan each data sheet and save it to a computer or portable memory storage device. You can take a photograph of each data sheet if you don't have a scanner. If you can save the information to a computer or storage device.
- **Back-up the data** - If data is being entered directly into a spreadsheet on a lap-top or tablet, then make a copy and save it to an external storage device, drop-box or email account.

- **Store completed data forms some place safe** – If you are doing several samples over the course of many days, never take filled out data forms back out into the field. Leave them in camp or at the office whenever possible.

RECORDING BYCATCH INFORMATION

Surveyors may choose to record information about the species captured in the traps other than crabs. Bycatch information is limited to identifying, counting and estimating the weight of all species for the entire set (all individual traps or all traps within a string). An example of a bycatch data form is provided in Appendix 3, along with codes for the species most commonly found in crab traps as bycatch.

It is important that crab sampling does not harm the populations of other species in the survey area. Therefore samplers may decide to collect the information on the bycatch and release the fish right away before sampling the crabs. Instead, a live-well or holding bucket may be used to hold the fish while the crabs are being processed. If holding the bycatch, they will need to be watched and their water may need to be refreshed from time to time.

SOURCES AND REFERENCE MATERIAL

MANUALS

"A Manual for Dungeness Crab Surveys in British Columbia" – J.S. Dunham, A. Phillips, J. Morrison, and G. Jorgensen. – Fisheries and Oceans Canada Science Branch, Pacific Region. 2011. http://www.dfo-mpo.gc.ca/Library/345188.pdf

FIELD GUIDES

"Whelks to Whales – Coastal marine life of the Pacific Northwest" – Rick M. Harbo – Newly rev. and expanded 2nd ed.

"Marine Life of the Pacific Northwest: A photographic encyclopedia" – Andy Lamb and Bernard P. Hanby

RELATED WEBSITE LINKS

First Nations Health Authority – Traditional Food Fact Sheets – http://www.fnha.ca/Documents/Traditional_Food_Fact_Sheets.pdf

Fisheries and Oceans Canada – Aquatic Species Research – Crab - http://www.pac.dfo-mpo.gc.ca/science/species-especes/shellfish-coquillages/crab-crabe/index-eng.html

Fisheries and Oceans Canada – Integrated Fisheries Management Plan Summary – Crab by Trap – Pacific Region – January 1st to December 31st, 2015. http://www.pac.dfo-mpo.gc.ca/fm-gp/mplans/2015/crab-crabe-sm-2015-eng.pdf

Fisheries and Oceans Canada – Management Areas – Pacific Region - http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/index-eng.html

Fisheries and Oceans Canada – Pacific Region Marine Charts, Maps and Data - http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/index-eng.html

Fisheries and Oceans Canada – Scientific Licenses for the Pacific Region - http://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/sci/index-eng.html.

GOVERNMENT CONTACTS

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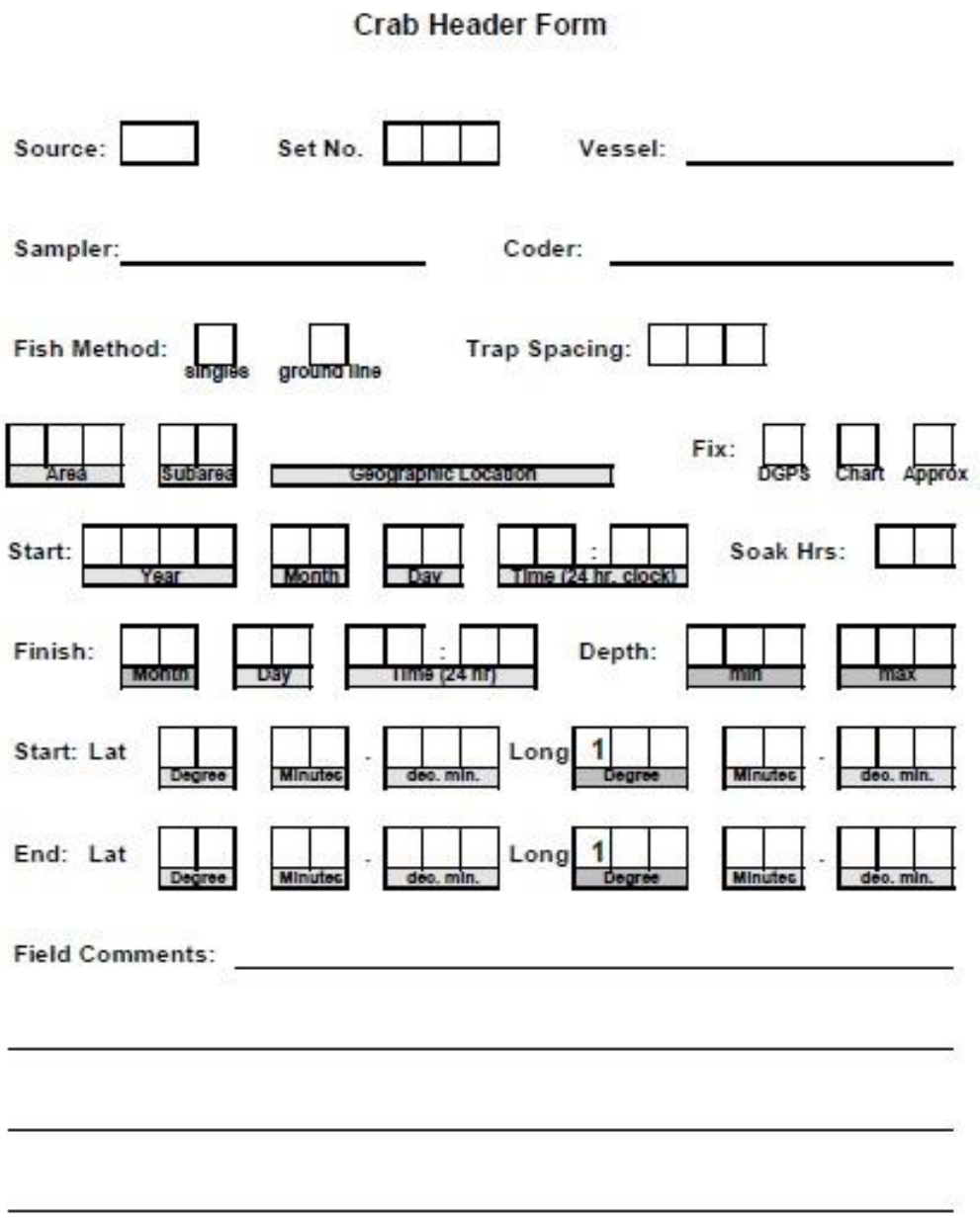
Ken Fong – (250) 756-7368, Ken.Fong@dfo-mpo.gc.ca

APPENDIX 1 – CRAB HEADER FORM EXAMPLE



Header Form Fields and Codes

Source – code for where the data came from ("FL" for First Nations).

Set Number – unique identifier for each group of traps. Should start at 001 and be consecutive.

Vessel – name of the vessel used for sampling.

Sampler – name and contact information.

Coder – name and contact information.

Fishing Method – are trap gear set on ground lines or as singles? Codes are provided.

Fishing Method

Code	Description
S	Single
G	Ground line

Trap Spacing – spacing between traps in meters.

Area – Pacific Fishery Management Area (e.g. 17).

Subarea – Pacific Fishery Management Subarea (e.g. 13).

Geog Loc – general location where sampling is being done (e.g. Departure Bay).

Fix – How was position determined? Codes are provided.

Fix

Code	Description
D	WAAS
G	GPS
C	Chart
L	Loran

Start Year (e.g. 2011)

Start Month – month when trap gear was set. Months are numbered 1 to 12 (e.g. 08 would be August).

Start Day – day when trap gear was set. Days are numbered 1 to 31 (e.g. 22).

Start Time – time when traps entered the water. Use the 24-hour clock (e.g. 14:15).

Soak Hours – time between the Start Time and Finish Time, rounded to the nearest hour (e.g. 21 hours).

Finish Month – month when trap gear was hauled (e.g. 08 would be August).

Finish Day – day when trap gear was hauled (e.g. 23).

Finish Time – time when traps were hauled. Use the 24-hour clock (e.g. 09:25).

Min Depth – minimum depth gear fished in a set. Record in meters.

Max Depth – maximum depth gear fished in a set. Record in meters.

Start Latitude Degrees – GPS position at one end of the string. Record in degrees.

Start Latitude Minutes – GPS position at one end of the string. Record in minutes and tenths of minutes.

Start Longitude Degrees – GPS position at one end of the string. Record in degrees.

Start Longitude Minutes – GPS position at one end of the string. Record in minutes and tenths of minutes.

End Latitude Degrees – GPS position at other end of the string. Record in degrees.

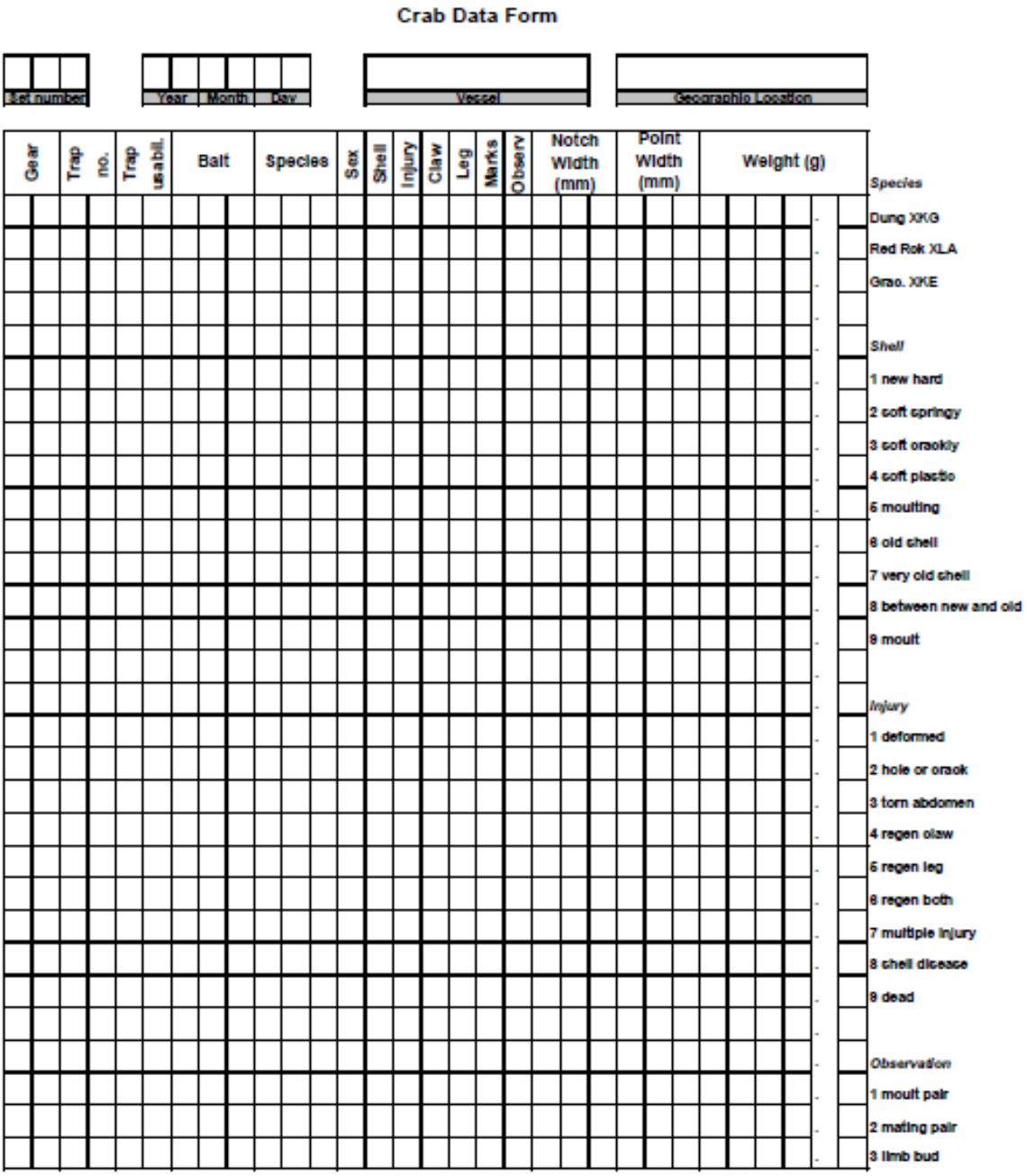
End Latitude Minutes – GPS position at other end of the string. Record in minutes and tenths of minutes.

End Longitude Degrees – GPS position at other end of the string. Record in degrees.

End Longitude Minutes – GPS position at other end of the string. Record in minutes and tenths of minutes.

Field Comments – record anything about the set that may influence how someone will interpret the data (e.g. lost two traps in the set or plenty of juvenile flatfish in the traps, etc.).

APPENDIX 2 – CRAB BIOLOGICAL DATA FORM EXAMPLE



Biological Data Form Fields and Codes

Set Number – unique identifier for each group of traps. This field relates the Data Form to the Header Form. Should start at 001 and be consecutive (001, 002, 003…).

Finish Year – last two digits of the year when the trap was hauled (e.g. 11 for 2011).

Finish Month – month when trap gear was hauled by number(e.g. 08).

Finish Day – day when trap gear was hauled (e.g. 23). This field relates the Data Form to the Header Form.

Vessel – name of the vessel used for sampling. This field relates the Data Form to the Header Form.

Geographic Location – general location where survey is being done (e.g. Departure Bay).

Gear –the type of traps being fished. Codes are provided in the DFO Crab Manual. The code for a DFO Standard trap is **76** (round one described in this manual).

Trap Number – consecutive, starting at 01. The last trap in the group/string is 99.

Trap Usability – identifies issues that may impact trap catch. Codes are provided in the DFO Crab Manual. Normally the trap usability code = 0 (no problems with the trap).

Bait Code – type of bait used in the traps. Codes are provided in the DFO Crab Manual. The code for standard bait (i.e. herring) is **HER.**

Species – codes for various types of crab caught in the trap. Codes are provided in the DFO Crab Manual. The code for Dungeness crab is XKG.

Sex – male or female. Codes are provided.

Sex

Code	Description
1	Male
3	Female
4	Female with eggs
5	Female spent (eggs hatching)

Shell – shell condition, an indicator of shell hardness and age. Codes are provided.

Shell Condition

Code	Description
1	*New hard shell*. No deflection on underside of carapace with heavy pressure from thumb. Very little claw wear and tips of claws are sharp and hooked. Few signs of wear or abrasions on carapace. May have barnacles, but these may be small.
2	*New springy soft shell*. Evident by slight shell deflection with heavy pressure on underside of carapace. Little epiphytic growth, fouling, or abrasion. Barnacles, if present, will be small. Underside of carapace still has dense orange or yellowish hair.
3	*New crackly soft shell*. Shell is easily deformed by finger pressure. Usually there is bright orange downy hair on underside of carapace.
4	*New plastic soft shell*. Shell is extremely soft. Crab has moulted within the past few days.
5	*Moulting crab*. The shell has split at the suture line at the back; however, the crab has not yet exited the old shell. Generally this stage lasts only one day. Shell conditions 4 and 5 indicate a moult is in progress and tend to be rare in data because crabs often avoid traps when moulting. The exception is in abandoned traps which act as a refuge for moulting crabs.
6	*Old hard shell*. Shows claw wear and often barnacle encrustation or other fouling growth. In exposed conditions the shell may appear clean and bright, but the claws will show signs of wear. Carapace spines will also be blunted as may be tips of walking legs.
7	*Very old hard shell*. Much claw wear, fouling growth. Males typically show old mating marks which have worn through claw; may have shell disease; tips of walking legs may be black or rotting off. Crab is lethargic and likely will not moult again or may soon die.
8	*Between a new (code 1) and old (code 6) hard shell*. Shell shows signs of wear, especially on teeth and tips of claws, but the crab is still relatively clean and vigorous. Typically the shell is hard, although prior to a moult the shell will soften slightly. Many crabs with this code indicate a moult is imminent.
9	*Carapace in trap*. Possible reasons include: a newly moulted crab was so soft it managed to squeeze out of the trap, a crab was cannibalized or devoured by an octopus, or a crab died and washed out of the trap as it was hauled to the surface.

Injury – codes for various injuries. Codes are provided. Leave blank if no injuries are observed.

Injuries

Code	Description
1	Deformed shell. Occurs at time of moult. Often misshapen shell or point rounded. Cannot obtain an accurate width measurement and should not be used for shell width analysis.
2	Hole or crack in shell.
3	Torn abdomen.
4	Regenerating claw(s).
5	Regenerating leg(s).
6	Regenerating both claw(s) and leg(s).
7	Multiple injuries. Record when more than one injury code is required.
8	Shell disease. Black spots on legs, claws, and underside of shell.
9	Dead. Crab died in the trap. Likely to occur with moulting, soft-shell, or very old shell crabs. May also be the result of octopus predation or amphipod kill. Even if sex is not apparent (due to missing body) measure the crab anyway. Ensure the shell is actually from a dead crab and not from a new moult. If this were the case, the gills and usually the lower portion of the shell will be attached and there will be a very soft crab of larger size in the sample.

Claw – number of missing claws not caused by sampling. Can be 1 or 2. Leave blank if all claws are there.

Leg – number of missing legs not caused by sampling. Can be 1 to 8. Leave blank if all legs are there.

Marks – mating marks on the insides of the claws on older shell males. Codes are provided. Leave blank if no mating marks are observed.

Mating Marks

Code	Description
1	Old (yellow)
2	New (white)

Observation – a list of a variety of observations. Codes are provided. Code 3 (limb bud) is most frequently used. Leave blank if none of the codes apply.

Observations

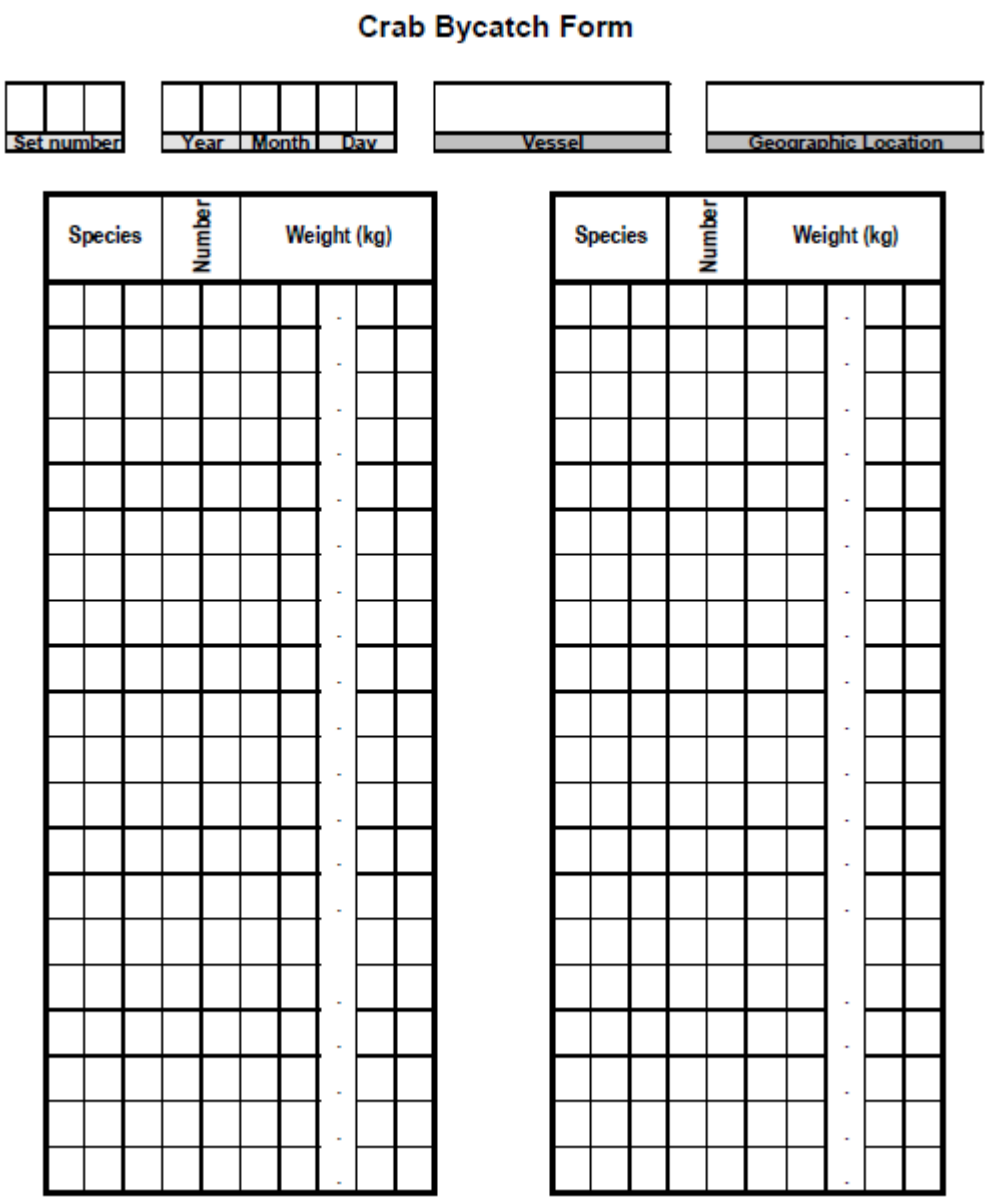
Code	Description
1	Moulting pair. When a moulted shell and the new crab are linked in the same trap. Data are recorded as if they are two separate crabs. The moulted shell is shell 9, the new crab is shell 4 and a 1 is entered for both crabs in the observation column.
2	Mating pair. Record in similar manner as for a moulting pair.
3	Limb bud. A fleshy miniature limb extruded sometime before a moult takes place. The bud indicates the crab is planning to moult as opposed to skip moulting. Record with the appropriate injury code.
4	Pink joints. Possible indication of microsporidia infection in the musculature.

Notch Width – width of the crab measured in millimetres, notch-to-notch, excluding the spines (e.g. 158). This is preferred over point-to-point measurements.

Point Width – width of the crab measured in millimetres, point-to-point, including the spines (e.g. 163). Not a necessary measurement.

Weight – weight of the crab measured in grams. Optional measurement.

APPENDIX 3 –BYCATCH INFORMATION DATA FORM EXAMPLE



Bycatch Data Form Fields and Codes

Set Number – unique number for each group of traps. This field relates the Bycatch Form to the Header and Data Forms. Should start at 001 and be consecutive (001, 002, 003…).

Finish Year – last two digits of the year when trap was hauled (e.g. 11 for 2011).

Finish Month – month when trap gear was hauled by number (e.g. 08 for August).

Finish Day – day when trap gear was hauled (e.g. 23). This field relates the Bycatch Form to the Header and Data Forms.

Vessel – name of the vessel used for sampling. This field relates the Bycatch Form to the Header and Data Forms.

Geographic Location – general location where survey is being done (e.g. Departure Bay).

Species – species caught other than crabs. Codes are provided (e.g. 4XE; sunflower star).

Number – total number of each species other than crabs collected from the set (all traps pooled).

Weight – collective (total) weight in kilograms of each species other than crabs collected from the set (all traps pooled). Can be estimated if no scale is available.

Cephalopods	Code	Common Name	Scientific Name
	98E	Pacific giant octopus	*Enteroctopus dofleini*
	98D	Octopus	Order Octopoda
	98G	Red octopus	*Octopus rubescens*
	98F	Smooth skin octopus	*Benthoctopus leioderma*
	91G	Stubby squid	*Rossia pacifica pacifica*
Echinoderms	**Code**	**Common Name**	**Scientific Name**
	4PD	Bat star	*Asterina miniata*
	4RA	Blood star	*Henricia leviuscula*
	5HA	Brittle stars	Class Ophiuroidea
	4XF	Fish-eating star	*Stylasterias forreri*
	6BB	Green urchin	*Strongylocentrotus droebachiensis*
	4OC	Leather star	*Dermasterias imbricata*
	4GD	Rainbow star	*Orthasterias koehleri*
	4HC	Mud star	*Ctenodiscus crispatus*
	4ZC	Giant pink	*Pisaster brevispinus*
	4ZA	Purple star	*Pisaster ochraceus*
	4GD	Sand star	*Luidia foliolata*
	6NA	Sea cucumbers	Class Holothuroidea
	4AB	Sea lilies	Class Crinoidea
	4GA	Sea stars	Class Asteroidea
	4TA	Sun star	Family Solasteridae
	4XE	Sunflower star	*Pycnopodia helianthoides*
	4JD	Vermillion star	*Mediaster aequalis*
Flatfish	**Code**	**Common Name**	**Scientific Name**
	596	Pacific sanddab	*Citharichthys sordidus*
	625	Slender sole	*Lyopsetta exilis*
Rockfish	**Code**	**Common Name**	**Scientific Name**
	407	Copper	*Sebastes caurinus*
	410	Darkblotched	*Sebastes crameri*
	414	Greenstriped	*Sebastes elongatus*
	424	Quillback	*Sebastes maliger*
	442	Yelloweye	*Sebastes ruberrimus*

Roundfish	Code	Common Name	Scientific Name
	455	Sablefish	*Anoplopoma fimbria*
	225	Pacific hake	*Merluccius productus*
	467	Lingcod	*Ophiodon elongatus*
	319	Northern ronquil	*Ronquilus jordani*
	222	Pacific cod	*Gadus macrocephalus*
	228	Pollock walleye	*Theragra chalcogramma*
	230	Red brotula	*Brosmophycis marginata*
	461	Kelp greenling	*Hexagrammos decagrammus*
	466	Whitespotted greenling	*Hexagrammos stelleri*
Sculpins	**Code**	**Common Name**	**Scientific Name**
	519	Blackfin	*Malacocottus kincaidi*
	499	Buffalo	*Enophrys bison*
	508	Dusky	*Icelinus burchami*
	521	Great	*Myoxocephalus polyacanthocephalus*
	502	Red Irish lord	*Hemilepidotus hemilepidotus*
	491	Roughback	*Chitonotus pugetensis*
	522	Sailfin	*Nautichthys oculofasciatus*
	472	Sculpins	Family Cottidae
	497	Spinyhead	*Dasycottus setiger*
	513	Spotfin	*Icelinus tenuis*
	518	Pacific staghorn	*Leptocottus armatus*
	510	Threadfin	*Icelinus filamentosus*
Selachii	**Code**	**Common Name**	**Scientific Name**
	044	Spiny dogfish	*Squalus acanthias*
	066	Spotted ratfish	*Hydrolagus colliei*