ROE HERRING MANAGEMENT PLAN HIGHLIGHTS

Mike Morrell, 23 Feb 2016

Summary
Fisheries and Oceans Canada (DFO) forecasts a total pre-fishery spawning population of 123,000 metric tonnes of herring for the entire Strait of Georgia (SOG) in 2016, with a probability of 90% that the actual population will be between about 80,000 and 183,000 tonnes. This population level would be toward the high end of the observed SOG populations since the beginning of the roe fishery in 1973.

DFO has assigned roe herring catch quotas of about 7,600 tonnes for purse seines and 10,500 tonnes for gillnets in Strait of Georgia. The roe herring quotas plus another 7,000 tonnes reassigned to the winter Food and Bait fishery add up to a total harvest in these fisheries of about 25,000 tonnes or 20% of the forecast pre-fishery biomass. DFO considers this a conservative or precautionary harvest. Several smaller fisheries, including First Nations subsistence harvest, will add another 1% or so to the total harvest rate.

I will post further information on the Conservancy Facebook page about in-season herring stock assessments, fishery openings and closures, spawning observations, etc as they are posted by DFO on the internet.

About Me
I'm a trained fisheries biologist and also a keen amateur birdwatcher. I've lived on Denman since 1987 and have been paying attention to the whole herring spawn phenomenon since I arrived. My professional fisheries experience has mostly been with salmon fisheries; I've worked with both First Nations and non-Native community groups on various projects. I've never worked for federal or provincial fisheries agencies, though I have frequently communicated with biologist colleagues in government agencies. Denman Conservancy (DCA) has invited me to be a resource person for this herring project; I am a friend and supporter of DCA but have no formal ties to the organization and do not speak on their behalf.

About Herring
Our herring, Pacific Herring (*Clupea pallasii*), are members of the Family Clupeidae, which includes other species of herring as well as anchovies, sardines, and pilchards.

The herring that spawn in Strait of Georgia (SOG) are treated by DFO as a single management unit (or stock). SOG spawners summer off the West Coast of Vancouver Island and migrate into SOG in early winter. Overwintering herring are not very active or obvious to a surface observer. In January and early February they become more active and spend more time in schools near the surface, where they are vulnerable to sea lions and sea birds and become more conspicuous to us.

Pacific Herring spawn in dense aggregations near shore in the intertidal zone and in the shallow subtidal. At spawning they are highly vulnerable to predators, including humans, and the feeding frenzies are spectacular. Unlike Pacific salmon, herring do not consistently home to specific spawning areas; but, that said, the waters around Denman and Hornby Islands are the most frequently used spawning areas in the province. Peak spawning here usually occurs during the first 10 days of March, but there may be some spawning as early as mid-February and as late as early April.

Spawning herring attach their eggs to seaweeds and rocks. The eggs develop over a 2 -3 week period depending on water temperature. Incubating eggs support large numbers of gulls, who feed mainly in the intertidal at low tide; at high tide large rafts of sea ducks concentrate in favoured areas and dive for eggs attached to the bottom.

The eggs hatch into mobile larvae, who drift in the plankton and begin to feed on small plankton once they have exhausted the yolk from their eggs. This is a critical life stage. If the onset of larval feeding coincides with the spring bloom of plankton, larvae are able to grow quickly and have relatively high survival; if not, larvae may suffer catastrophic mortality. This boom and bust pattern of larval survival leads to large fluctuations in herring populations; one or two strong year-classes from years of high larval survival may sustain the adult population for several years, and a series of poor year-classes can leave a population depressed.

In June/July larvae transform into juveniles, which resemble small adults. Juveniles remain in the SOG for at least one winter and sometimes longer before joining the adult population in their second or third year of life. Adult herring do not die after spawning like salmon and may spawn in successive years. This can be seen as a way of evolutionary bet-hedging as spawners spread their reproductive effort over several years and improve their odds of hitting at least one year favourable to larval survival. Adults can live longer than 10 years, but in SOG fish older than 8 years are rare.

About Herring Management

In BC, Fisheries and Oceans Canada (usually abbreviated "DFO") is responsible for herring conservation and management. DFO is the best source of biological and management information on BC herring, and I rely on them for most of what I have to say here. This does not imply my endorsement of DFO's approach and policies. However, DFO is the final management authority (disputed by First Nations), and it's important to understand their thinking and management strategies.

The following analysis is based on DFO's 2015/16 herring management plan, which was released in final form last Friday 19 Feb. The plan is long (159p) and much of the content is technical and challenging; however, it also contains quite a bit of fairly plain language regarding history of the fishery and management strategy. The plan is available

by request from DFO. I have an electronic copy that I will e-mail to anyone interested--e-mail me at mmorrell@uniserve.com.

For management purposes, DFO divides the BC coast into 5 major and 2 minor geographical management areas, which are considered to represent more or less discrete herring populations. The Strait of Georgia is one of the major areas and the one that since the beginning of the roe fishery in the 1970s has supported the greatest abundance of spawning herring and the largest catches. Other major management areas are Haida Gwaii, Prince Rupert District, Central Coast, and West Coast Vancouver Island.

Before the roe herring fishery in spring DFO uses computer modelling to forecast the expected size of the spawning stock in each management area before any fishing; stock size is expressed in metric tonnes. The model projects stock abundance based on past year abundance modified by estimated survival, growth, and recruitment of juveniles to the adult population. Model parameters are derived from 65 years (1951-2015) of historical data on commercial catch, quantitative surveys of annual spawn abundance, age composition of the population, and the weight of herring at different ages.

For each management area DFO estimates the hypothetical population size in the absence of fishing. If forecast stock abundance in any area is below 25% of the unfished stock estimate, then managers do not recommend a commercial harvest. If forecast stock abundance is well above this commercial cutoff point, then managers recommend commercial harvest of up to 20% of stock size (total weight or biomass). DFO considers this a "conservative" harvest rate, and it is well below the harvest rates in the fish meal fishery that preceded a coastwide population crash in the mid-1960s. In areas above the minimum fishable population size but where there are conservation concerns, managers may recommend a harvest rate of 10% or less.

In the coming weeks DFO will begin assessing the actual herring population using chartered commercial vessels to conduct sonar surveys. The results of these surveys and other announcements will be posted online by DFO on a daily basis (except on weekends) once the charters begin. I will monitor these announcements and will post digests of the assessments on DCA's Facebook page as they are released.

Conclusions for Strait of Georgia in 2016

DFO forecasts a total pre-fishery spawning population of 123,000 metric tonnes, with a probability of 90% that the actual population will be between about 80,000 and 183,000 tonnes. This population level would be toward the high end of the observed SOG populations since the beginning of the roe fishery in 1973.

The forecast population is well above the commercial cutoff minimum, and DFO has assigned roe herring catch quotas of about 7,600 tonnes for purse seines and 10,500 tonnes for gillnets. These roe herring quotas plus another 7,000 tonnes reassigned to 40

seine licensees who opted to leave the roe herring fishery and fish their quota in the winter Food and Bait fishery add up to a total harvest in these fisheries of about 25,000 tonnes or 20% of the forecast biomass. Several smaller fisheries, including First Nations subsistence harvest, will add another 1% or so to the total harvest rate.

As usual the herring stock and the roe fishery in Strait of Georgia will be much larger than roe fisheries on the rest of the coast. There will be no net fisheries for roe in either Haida Gwaii or West Coast Vancouver Island due to low herring population forecasts. There will be small roe fisheries in the Prince Rupert District (about 2,300 tonnes) and Central Coast (about 200 tonnes).