

submitted at request of
board member Johnson

Herring Life Cycle Excerpts

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RC 370

What follows is gathered from the "The Life Cycle and Ecology of Pacific Herring" section (p104-160) of Tom Thornton's Herring Synthesis. It illuminates some of the Traditional Ecological Knowledge regarding the life cycle of the Herring.

III. THE LIFE CYCLE AND ECOLOGY OF PACIFIC HERRING'

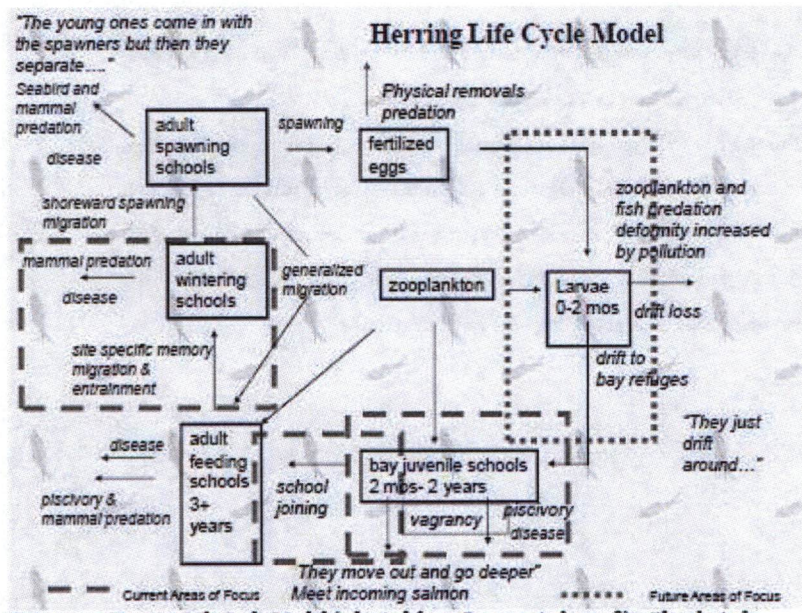


Figure 3.1. Herring Life Cycle Model (adapted from Brown, et al. 2008) with selected LTK quotes

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Tlingits refer to a special wind, the "wind of the washing of the spawn," which typically arrives shortly after spawning and blows the fertilized eggs off the beaches and allows the herring to survive. Al Martin (Juneau), a T'akdeintaan originally from Hoonah commented:

It's called the "Wind of the washing of the spawn;" L'uk'eeri.oosk. I never heard about all the biologists talking about how the herring had to be washed clean from the beach so the herring can survive, all of the herring; but the Tlingit knew for centuries.

Harvey Kitka (Sitka) notes that this wind used to be more predictable vis-à-vis spawning than it is today, a fact that may be attributable to climate change.

[I]t used to be we'd get—once the herring were through spawning—within three days after spawn, we'd get a big storm. And as the waves go, just like big circles in the water, they shake the eggs loose, and it also helps how many will hatch out ... that was nature's way of getting more. Now we don't get storms like that anymore. It used to be about three days after that spawn.

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Those eggs stranded on the beach or laid too deep offshore do not survive to the larvae stage. Harvey Kitka observes,

And according to the old Indians--my dad and some of my uncles that talk about it--six feet above the low water line and almost three feet below, those are the only ones [herring hatchlings] that swam away. Anything deeper than that or anything shallower than that died.

Aware of this, some Tlingits targeted non-viable eggs in the zone lying more than 3 feet below the mean low water line for egg harvest, as a means of conserving the viable stock in the "survival zone." (Setting above 6 feet is not practical given the presence of birds and other predators.) Harvey Kitka states, "Well, that's why when we set our branches it's three feet below the minus tide because it didn't bother the stock at that point." Another strategy was to select particularly thick eggs, the innermost layers of which were considered non-viable due to the milt not penetrating more than several layers.

It was also a custom among some Tlingits to transplant eggs laid in the non-viable zones to places where they were more likely to survive, or to areas they wish to see revitalized or re-populated through "seeding." As Harvey Kitka explains, "I believe there's a few other people who have started to do that. ... Some people are trying to take some back in Deep Inlet and other places," effectively to restock those areas. Transplanting was also carried out on eggs considered too thinly laid for eating. Harvey Kitka further explains, "I take some of the branches ... some of the thinner ones I get, and put it [in areas that need re--populating]. They claim that the herring will survive out of water for almost three days. As long as you get them back in the water they'll, within three days, they'll swim away."

His father, Herman Kitka Sr., a Sitka elder born in 1914, adds:

It seems like the one that the tide uncovers--the one that minus tide uncovers are the ones that survive is what the old people said. And the one that

Predation remains the biggest threat to herring once eggs have hatched. Harold Martin, originally from Kake but now living in Juneau, observes:

It's mind boggling to think how herring survive. From the time they spawn, the crows, the ravens, the seagulls, the eagles, sculpins, the trout, you know. You name it, they're all feeding on it. And when they hatch then the ducks and everything else are—you know it's surprising how many can come back at all. They're just so important to the total food chain, on every animal you know, in the sea. They feed everything. They feed everything. They're important to everything. We always—we've always felt—we didn't like the idea of commercial fishermen coming in and taking them on a large scale because they're very important to our salmon and especially king salmon, you know. And they feed our seals and stuff like that. Things that we're depending on.

This perspective was echoed by many others, who stressed the importance of herring in the marine food chain, as "being the feed for everything." Even invertebrates, such as jellyfish, are known to feed on herring (Brown and Carls 1998).

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Similarly, Gordon Greenwald of Hoonah notes in spring, "sometimes you'll catch salmon and they'll—their stomach will be just full of [little herring]." Charlie Skultka adds:

They drift. I see them, like they're right up against the beach, a lot of them. And oh, geez there's umpteen different predators ... I've watched this cycle, ok. The herring come in, they spawn. Got these little babies swimming around there. And they're there. I see them every year, but the seagulls feed on them, the ducks feed on them, the Dolly Varden feed on them. After they get a little bigger, bigger fish feed on them. They run this whole gauntlet, and I've been out here picking my eggs in March and April. And that's when the humpy fry start. I've watched little schools of humpies like there might be two hundred in a bunch. They come across spawning herring and the spawning herring will eat the humpy fry. So it's a vicious circle. Yeah, but we have such a good spawn here.

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As they mature, herring larvae eventually shed their yolk-sacs and become dependent on other food sources, particularly invertebrate eggs and zooplankton (Brown and Carls 1998). At this stage the viability and distribution of herring schools becomes more closely tied to the bounty and distribution of critical food sources, such as krill and copepods.

Eric Jordan, a troller from Sitka, comments on the important relationship between zooplankton, krill, herring, and king salmon.

What happens, and it's just amazing how this all coincides, the herring spawn in April, late March and early April. And the spawn-outs, you know, they're weak and they drift out into the Sound and out toward the Cape and at the same time the krill hatch comes on. And so then we have all these little krill which are just ideal feed for the herring. So you've got these spawn-outs that are kind of weak in condition. The king salmon come up and into the Sound to feed on those and also to feed on the krill. So when we're targeting king salmon this time of year, the king salmon are feeding on krill and herring. They're changing from worms and an occasional herring and not eating much all winter, to they're starting to also feed on the krill and the herring. So you've got this krill hatching this time of year. You've got the spawn-out herring starting to feed on that. You've got the king salmon coming in and feeding on the herring and the krill. So we're looking for these schools of herring and schools of krill this time of year from the line at the Cape [Edgecumbe] in, all over the Sound. And wherever there's any concentration of those, we'll fish king salmon. So we're, as trollers, as salmon

Many consultants remarked on the mixed age of adult stocks. Al Martin notes, for example, that sexually immature herring will accompany older herring on spawning runs but will not spawn or will 'spot spawn,' thinly distributing their eggs in small areas in a way that fails to produce high quality eggs for harvest. In addition,

[T]here's a seven-year old herring and a twelve-year old herring. And there's also a three-year old herring. The three-year old herring--this is the legend. We know it by Tlingit story. The three-year old herring don't spawn completely. They show the sign of spawn, but the spawn is sparse. The matured herring, only the matured herring, the seven-year old herring completely spawn and that's the spawn they harvest in Sitka: seven-year old herring. And it's immaterial to harvest the young herring at an early stage, they're killing off the herring run prematurely.

The diversity of age classes within a local herring population contributes to its stability and resilience.

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Seagulls are said to have named herring, as noted above, on the basis of the "yaaw" sound they make when spawning herring are present (Herman Kitka). Clara Peratrovich observes:

Yeah. You can always hear when the seagulls come in you know, before the spawn. The people used to listen to the seagulls that fly in search [of herring]. And sometimes they'll sit and they all make noise, you know, squawk. You can hear when they're full. Their voice sounds different when they're cheering. They say, 'It's got herring sound in its mouth. It sounds like it ate herring.' So they start searching. Sure enough they see the herring moving in. ... That's the sign of wealth coming in. 'Yaaw.'

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As the female herring ripen they move toward shore in preparation for spawning.

This is a critical period, and in some communities it was considered taboo to disturb the spawning areas when the herring were moving in. Harold Martin of Kake described it as

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part of a broader Tlingit "traditional respect for the reproduction period. ... we don't bother them [during spawning]." Dick Stokes of Wrangell notes, "we weren't allowed to do anything in there [the spawning grounds]. ...Yeah, we just had to stay away. We'd go in and set the ... young hemlocks. They used young hemlock trees, or branches because if you use the old, it's real bitter. [Then would move out]. Similarly, Byron Skinna of Klawock remembers that in the spawning areas,

You weren't allowed to use an outboard motor. A big boat was not allowed in there. You had to use skiffs and you had to row in. Any spawning area whether it was Fish Egg Island or some other place that they spawned. You weren't allowed to run in there with outboards, or everybody in town was hollering at you. Everybody! Not just one or two people. Boy, the people really got mad at you. They just really read you the riot act if you got to the beach.

The reason ... is because we didn't want the herring disturbed. You had to row. ... [Today] you've got all kinds of traffic out there. You've got seine boats, power skiffs, speed boats, small people that are doing the commercial herring spawn out there. And they're running full bore through there. ...Yeah. They run wide open and they're disturbing the herring.

Lily White of Hoonah echoes this principle:

They knew when it was going to spawn so they kept the place clear of people going over and everything; leave it alone, let them spawn. Don't want to disturb them. ... They'll tell the people, "Nobody runs out on a boat up there. Just leave it alone. They're coming in now." Nobody runs around it and messes up the waters. They knew how to preserve what they're going to get; what they're going to eat.

Non-reproductive adults, be they too young or too old, appear to segregate during spawning itself, but all classes travel together in mixed groups to the spawning areas. According to Franklin James "the big ones do travel with [the] other ones, the smaller ones, the younger generation. But the big ones don't after--what is it--after eleven years, they don't spawn no more, but they do travel with them. So you see a lot of them, when they make those big sets have to dump them." The mixed age classes represent a healthy stock then, whereas too many larger, older fish could mean that the stock is in danger of collapsing as the larger fish cease to be productive.

Scientists refer to the process of older fish initiating younger fish to migration paths and spawning areas as "entrainment." The entrainment hypothesis (Petitgas, et al 2006) posits that "spawning migrations are sustained by repeat spawners," mature fish that have "knowledge of migration routes" and thus "are responsible for the persistence of the life cycle spatial organization" and connectivity of disparate spawning populations (Secor, et al 2009) by leading first spawners from feeding grounds to spawning destinations. From this perspective, a diverse population age structure is critical to maintaining the spatial distributions of herring stocks. Loss of too many spawners in a local stock, especial repeat spawners, can can jeopardize entrainment and lead to the

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abandonment of local spawning areas. This hypothesis has not been thoroughly tested on herring, but seems worthy of further investigation in light of its convergence with the LTK citing the importance of mature fish leading first time spawners to various spawning grounds.

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