ALASKA STATE LEGISLATURE
HOUSE SPECIAL COMMITTEE ON FISHERIES
March 14, 2019
11:09 a.m.

MEMBERS PRESENT

Representative Louise Stutes, Chair
Representative Bryce Edgmon
Representative Chuck Kopp
Representative Geran Tarr
Representative Sarah Vance
Representative Mark Neuman

MEMBERS ABSENT

Representative Jonathan Kreiss-Tomkins

OTHER LEGISLATORS PRESENT

Representative Sara Hannan

COMMITTEE CALENDAR

PRESENTATION(S): SALMON HATCHERIES~ THE ALASKA HATCHERY RESEARCH PROGRAM~ AND BEING A WISE CONSUMER OF SCIENCE

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

SAM RABUNG, Director
Division of Commercial Fisheries
Alaska Department of Fish and Game (ADFG)
Juneau, Alaska
POSITION STATEMENT: Provided a PowerPoint presentation titled "Salmon Fishery Enhancement in Alaska."

BILL TEMPLIN, Chief Salmon Fisheries Scientist
Division of Commercial Fisheries
Alaska Department of Fish and Game (ADFG)
Anchorage, Alaska

POSITION STATEMENT: Provided a PowerPoint presentation titled "Enhancement Related Research."

ACTION NARRATIVE

11:09:09 AM

CHAIR LOUISE STUTES called the House Special Committee on Fisheries meeting to order at 11:09 a.m. Representatives Vance, Kopp, Neuman, Edgmon, and Stutes were present at the call to order. Representative Tarr arrived as the meeting was in progress.

PRESENTATION(S): Salmon Hatcheries, the Alaska Hatchery Research Program, and Being a Wise Consumer of Science

11:10:20 AM

CHAIR LOUISE STUTES announced that the only order of business would be a presentation on Salmon Hatcheries, The Alaska Hatchery Research Program, and Being a Wise Consumer of Science provided by the Alaska Department of Fish and Game (ADFG).

CHAIR STUTES noted there is a lot of concern and focus on salmon hatcheries right now on the Board of Fisheries, including the straying of hatchery fish, what effects that might be having, as well as how to be a good consumer of the science that is out there on the issue. As such, she thought it would be useful to educate the committee on the issue with a series of presentations. This will be the first segment followed by a presentation from the different regional aquaculture associations. Also, there will be a trip to the Douglas Island Pink and Chum, Inc. (DIPAC), the local hatchery in Juneau.

11:11:40 AM

SAM RABUNG, Director, Division of Commercial Fisheries, Alaska Department of Fish and Game (ADFG), provided a PowerPoint presentation titled "Salmon Fishery Enhancement in Alaska." Addressing slides 2-4, he began his presentation by asking, "Why do we have a fishery enhancement program in Alaska?" He related that the State of Alaska assumed control of fisheries management in 1960 and instituted a new system of escapement based in-season management. Only 21 million salmon were harvested in 1967, down from a peak of about 126.5 million in 1936. Between 1972 and 1975 Alaska experienced the lowest number of commercially harvested salmon of the century. In 1971 the State

of Alaska initiated its current salmon fishery enhancement program in response to these severely depressed commercial salmon fisheries.

MR. RABUNG explained that Alaska took two approaches to address the weak fisheries. First, commercial fisheries management changes were made to provide for adequate escapement of spawners. Second, a new division was formed called the Fisheries Rehabilitation Enhancement and Development (FRED) Division. The FRED Division was tasked with developing the knowledge, infrastructure, and support systems necessary for rehabilitation and enhancement of Alaska's salmon fisheries through hatchery production and other means. This integrated approach to recovering salmon included: using escapement-based in-season management to ensure enough spawners would make it back; creating the limited entry program for the commercial fishery, the first in the nation and which stabilized the number of fishermen and the amount of gear/fishing power; and beginning the program of fisheries rehabilitation and enhancement to recover the depleted runs. In 1972, Article 8, Section 15, of the state constitution was amended to allow for limited entry and for "the efficient development of aquaculture" in Alaska. The 1976 Magnuson-Stevens Act restricted foreign fishing to outside the 200-mile limit, which no doubt contributed to improving Alaska's fisheries.

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MR. RABUNG moved to slide 5 and reported that the private sector was allowed to join the effort in 1974 via the Alaska State Legislature's passage of the "Private Nonprofit Salmon Hatchery Act." The legislature wanted the state to engage in this program of fishery rehabilitation as well as to set in place the mechanism for private nonprofit (PNP) aquaculture corporations to own and operate salmon hatcheries and contribute to the common property fishery. Some have said the state began to adopt a user-pay philosophy at this time. Turning to slide 6, Mr. Rabung related that the purpose of the PNP salmon fishery enhancement program is the recovery and support of Alaska's salmon fisheries and to provide an economic engine to support and grow coastal communities. This program is not about fish, he stated, but rather fisheries.

MR. RABUNG addressed slides 7-12 and explained there is guidance in the state constitution, Alaska statute, regulations, and policy. He pointed out that the FRED division was established under Alaska Statute (AS) 16.05.092. The primary regulation for

private nonprofit salmon hatcheries is in the chapter for commercial fisheries regulations, 5 AAC 40.005-990. The genetics policy, promulgated in 1985, is a primary guidance of the program, and all the other policies that were developed to guide the program have been adopted into regulation.

MR. RABUNG turned to slide 13 and said the hatchery program, by design, is stakeholder driven and the users of the resource determine what fishery enhancement is desirable in their area while ADF&G determines what is appropriate within its mandate to sustain natural production. The mechanism for this cooperative effort is the Regional Aquaculture Association (RAA) working with ADF&G within the Regional Planning Team (RPT) process to develop a regional salmon plan. He said the map on slide 14 shows the different salmon fishery enhancement planning regions in Alaska. Not all of them have active programs. Only southern Southeast Alaska, northern Southeast Alaska, Prince William Sound, Cook Inlet, and Kodiak have active programs.

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MR. RABUNG displayed slide 15 and pointed out that the primary responsibility of the RPTs is regional comprehensive salmon planning. The RPTs are advisory to the ADF&G commissioner on salmon fisheries enhancement planning and permitting within their regions. He said he likes to use the analogy that the [fish and game] advisory committees are advisory to the Board of Fisheries and the RPTs are advisory to the commissioner.

MR. RABUNG moved to slides 16-17 and stated that the RPT is comprised of three voting members from the regional aquaculture association, three voting members from ADF&G, and the public is invited and encouraged to participate. There are often ex-officio non-voting seats that represent other user groups. All those things come together to provide recommendations to the commissioner. The primary duty of an RPT, he reiterated, is developing a regional comprehensive salmon plan. That plan is supposed to document historic harvests and production and document the desired harvest goals by species, area, and time, as well as to identify any project opportunities to fulfill these plan goals and objects. Not every region chooses to have a salmon fishery enhancement program and that is by design. Every region gets to make its own decisions on what is desirable within its area.

MR. RABUNG explained that the graph on slide 18 shows production in the North Pacific of all nations - Canada, Japan, Korea,

Russia, and the U.S. - for all salmon species for the years 1952-2017. The release numbers have been stable since about 1988 at about 5 billion juvenile salmon released annually. Chum salmon is by far the predominant species, followed by pink salmon. Responding to Chair Stutes, he said Cherry salmon occur in Asia and is similar to a Chum salmon.

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MR. RABUNG stated that the maps on slide 19 show the location of the active hatcheries in Alaska. They are primarily located in Southeast Alaska and Prince William Sound area, with two in the Kodiak area and a few in the Cook Inlet area. He noted that slide 20 is a graph of Alaska's hatchery production from 1973-2018. The bars on the graph represent all species stacked and all regions combined. Prince William Sound releases the most in terms of numbers, primarily pink salmon, followed by Southeast Alaska which releases primarily chum salmon. Since 1995 the annual smolt releases have ranged from about 1.4 to 1.8 billion, with the highest number released in 2018 at over 1.8 billion.

MR. RABUNG discussed the graph on slide 21 depicting the Alaska commercial wild stock salmon harvest from 1900-2018 along with the graph on slide 22 showing the hatchery harvest on top of the wild stock harvest. The hatchery program didn't begin until 1974, he noted, so all production prior to that time was wild stock. This graph, he pointed out, demonstrates that increased wild salmon harvest levels occurred alongside Alaska's robust fishery enhancement program that began in the mid-1970s. The enhancement program is designed to supplement the harvest without having a negative effect on wild productivity. Mr. Rabung concluded with slide 23, which stated: "Alaska's contemporary salmon fishery enhancement program has operated since the mid-1970s, and through 2018 has provided over 1.8 billion salmon to the fisheries of the State, resulting in substantial economic value without any obvious negative effects on natural salmon production."

11:23:00 AM

BILL TEMPLIN, Chief Salmon Fisheries Scientist, Division of Commercial Fisheries, Alaska Department of Fish and Game (ADF&G), provided a PowerPoint presentation titled "Enhancement Related Research." He noted there might be some concern around hatcheries, so he will address what ADF&G is doing about that concern in terms of research and how ADF&G plans to interpret the information it receives from the research.

MR. TEMPLIN displayed slide 2 and said Alaska's constitution was revised with a provision that required the state's resources be utilized, developed, and maintained on the sustained yield principle, subject to preferences among uses. He said the sustained yield principle was intended to provide continued production from the state's natural resources.

MR. TEMPLIN turned to slide 3 and related that ADF&G's mission statement requires the department to protect, maintain, improve, and manage the use and development of the state's fish, game, and aquatic plant resources. These four requirements, he pointed out, are a balancing act for managing these resources. He further related that the mission statement says that these resources are to be managed in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle. He read a quote from R.A. Cooley, which states, "It must be recognized that the welfare of people and not fish is the reason for a management program, and that if maximum sustained yield has any validity, it is as a means to important human ends rather than as an end itself."

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MR. TEMPLIN moved to slide 4 and reviewed the United Nations' definition of sustainable development, which is: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." He said "fishery" could be substituted for "development" in that definition and it would then become a definition for sustainable fisheries.

MR. TEMPLIN showed slide 6 and advised that policy includes statements about how to do sustainable management. Addressing the policy for the management of sustainable salmon fisheries under 5 AAC 39.222(c), he noted that paragraph (5) recognizes there is uncertainty in salmon stocks, fisheries, artificial propagation, and habitat; so, in the face of that uncertainty, management must be conservative. This means that the approach must be precautionary - thinking ahead and understanding the potential risks even when not having all the information.

MR. TEMPLIN discussed the working definitions of precautionary principle and precautionary approach outlined on slide 6. He defined "precautionary principle" as the rule or standard that is applied "when human activities may lead to morally unacceptable harm that is scientifically plausible but

uncertain, actions shall be taken to avoid or diminish that harm." He defined "precautionary approach" as the method that should be applied: "A set of agreed cost-effective measures and actions, including future courses of action, which ensures prudent foresight, reduces or avoids risk to the resources, the environment, and the people, to the extent possible, taking explicitly into account existing uncertainties and the potential consequences of being wrong."

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MR. TEMPLIN turned to slides 7-8 and continued discussing precautionary approach as defined in SSFP 5 AAC 39.222(c)(5)(A), which states: "a precautionary approach, involving the application of prudent foresight that takes into account the uncertainties in salmon fisheries and habitat management, the biological, social, cultural, and economic risks, and the need to take action with incomplete knowledge, should be applied to the regulation and control of harvest and other human-induced sources of salmon mortality; a precautionary approach requires". He pointed out that action is often needed in the face of incomplete knowledge, and that currently this is where things are at with enhancement related activities. [Managers] must act in a precautionary manner, they don't have all the information but are working to gain it, and [managers] need to think about the risks - biological, social, cultural, and economic.

MR. TEMPLIN displayed slide 9 and asked, "Why are we doing this? Why is it an issue that potentially hatchery fish stray?" He noted that there are a variety of opinions in answer to these questions. These questions are faced because Alaska has taken on hatcheries and salmon enhancement as a means to economic benefit. But in the face of that production, there is also the requirement to sustain the natural production of salmon.

MR. TEMPLIN explained that straying and homing are part of the natural life cycle of Pacific salmon. He said some species home more than others and that the benefits of homing include: allowing the salmon to develop local adaptations; leading to greater differences between populations; and leading to improved survivals of the offspring when they come back because they fit the environment better and can then be more production. But, he continued, there are also benefits from straying, which include: accessing new habitats, like Glacier Bay; increasing diversity within populations, because having some interaction between separate groups maintains a large amount of genetic diversity within the population; and buffering temporal variation in

habitat quality, such as a flood event wiping out one population. Therefore, homing and straying act in balance in different salmon populations and species.

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MR. TEMPLIN provided examples of homing and straying. Showing slide 11 he stated that sockeye salmon have strong homing. Sockeye have long freshwater residency, so they need to be in a lake system that is good for their offspring to grow in. That leads to higher variability in habitat because in a lake system the salmon can spawn along the shore, the stream that comes into the lake, or a stream that goes out of the lake. Lake systems tend to have higher stability in habitat, which leads to variable-year life cycles such that sockeye could return at ages anywhere between two and five years old. Mr. Templin moved to slide 12 to discuss Pink salmon as a counter example, which have a short freshwater residency. As soon as emerging from the gravel, pink salmon tend to go right out to the ocean, whereas sockeye can stay from zero to three years in a lake system. Streams have lower variability in habitat as well as lower stability in habitat. Because of this, pink salmon tend to have a one-year life cycle, meaning two years - from the time that they emerge they will return a year later. In some ways, this can lead to lower selection for homing, so pink salmon will stray more as a species than sockeye salmon.

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MR. TEMPLIN turned to slide 13 and said stray rates can mean different things to different people. He explained that "stray in rate" or "recipient stray rate" is the proportion of fish in a spawning location that were not born in that location. The "stray-out rate" or the "donor stray rate" is the proportion of fish from a spawning location that did not return to that location, they went somewhere else. Therefore, thinking about straying depends on the perspective of whether it is straying in or straying out. He advised that for the rest of his presentation he will be talking about the stray in rate, because that is what many people are concerned about - hatchery fish in wild fish spawning streams.

MR. TEMPLIN displayed slide 15 and said Special Publication No. 18-12 is ADF&G's review of Alaska's precautionary approach. He said there are structures in place - policies, plans, permits - that recognize the risks and try to control those risks so Alaskans can receive the benefit. As part of these policies,

there are directions for management, for maintaining fish health, and for maintaining genetics. This report provides two case studies, he noted, one for Southeast Alaska king salmon and the other for Prince William Sound pink salmon.

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MR. TEMPLIN showed slide 16 and discussed the policy elements that are dealt with in the management policy, fish health policy, and genetics policy. For management it is established that wild stock conservation is the priority; that management must be for sustained yield; and that management recognizes that hatchery and wild fish stocks do interact and that wild fish stocks interact and there must be management accordingly. For fish health there is a recognition that there can be health concerns with bringing fish into a hatchery. So, there is a robust pathology lab and program and there are inspections to ensure that the release of hatchery fish doesn't add a disease load to the wild populations. The genetics policy describes things like using appropriate local stocks. Local stocks are used so that if there is an interaction, if hatchery fish do stray out of the hatchery and into the local rivers that they originated from that river and so more likely to be genetically benign. Also, significant or unique wild stocks were identified as well as wild stock sanctuaries. Additionally, there is assessment of hatchery and wild stock interaction and impacts.

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MR. TEMPLIN turned to slide 17 and stated there needs to be assessment of hatchery and wild salmon stock interaction and impacts. Studies done in the past decade or so document that there are hatchery fish in wild systems. He explained that the otolith in hatchery fish is marked with a banding pattern, so by collecting carcasses in a stream the otoliths can be read to determine whether the fish originated from a hatchery or the wild. Based on those observations, he continued, ADF&G has two ongoing studies. One study is in the Lower Cook Inlet looking at the contributions of hatchery pink salmon to harvests as well as the escapement. The other is a much larger long-term study called the Alaska Hatchery Research Program, which is looking at pink and chum salmon in the Prince William Sound region and the Southeast Alaska region. This study has shrunk down all the potential research that could be done to three questions that have a reasonable chance of being answered.

MR. TEMPLIN moved to slide 18 and elaborated on the Lower Cook Inlet pink salmon study. He said this study is being conducted in Homer by biologists Ted Otis and Glenn Hollowell. The Tutka Bay Lagoon Hatchery and the Port Graham Hatchery had produced pink salmon a decade ago but were shut down; they have now been restarted. The purpose of this study is to gather baseline data on the hatchery-wild composition of harvests and escapements in Lower Cook Inlet now that these two recently reopened hatcheries are releasing marked fry.

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MR. TEMPLIN spoke to slide 19. He said the study's first objective is to estimate hatchery-wild composition of the commercial harvest to evaluate any benefits to fishermen. The second objective is to monitory escapement of hatchery fish to pink salmon streams and to see if in the presence of hatchery fish and harvest directed on hatchery fish that escapement goals within those streams could be met. Addressing slide 20, he stated that the cost recovery harvest in Tutka Lagoon and Port Graham is largely composed of pink salmon generated from those hatcheries. As well, good portions of pink salmon from these hatcheries are contributing to the common property harvest.

MR. TEMPLIN moved to slide 21 and noted that escapement has generated a lot of public interest because local hatchery strays are being found in Lower Cook Inlet streams, along with some Prince William Sound pink salmon, which wasn't expected. As shown on the map, he explained, opportunistic samples have been collected on 10 streams over four or five years. Numbers are depicted for each stream - the top number being the average proportion in those samples of Prince William Sound fish and the lower number being the Lower Cook Inlet origin hatchery fish. He drew attention to the numbers for Barbara Creek and noted that on average of the samples collected, 3.5 percent were from Lower Cook Inlet hatcheries and [27.4] percent were from Prince William Sound.

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MR. TEMPLIN addressed the six conclusions presented on slide 22 for the Lower Cook Inlet pink salmon study. He explained that the biologists are collecting information but that a long-term, well-designed study needs to happen to start addressing the observations that are being seen. Therefore, he advised, the conclusions must be relatively weakened because the samples are not from a designed study, they are opportunistic. That doesn't

mean that these observations are unimportant. One conclusion, he pointed out, was that the pink salmon index streams still meet their escapement goals just about as often as they normally would - about 80 percent of them over the five years have been met and that is about what the department average is. So, escapement is being met even in the presence of fishing on the hatchery fish. Another conclusion was that Lower Cook Inlet hatchery-produced pink salmon present in the stream samples can range from 0 percent to 87 percent. Mr. Templin qualified that while 87 percent seems large, the 87 percent was a one-time occurrence in one location. An additional conclusion was that interpretation of current data is limited given the few years of sampling and that there is not a designed study here. It is important for ADF&G to be able to use information from this project and to push ahead and develop a program to answer how much of the actual escapement in Lower Cook Inlet or in these streams is from hatchery fish. These numbers cannot be used to generate that, it can only be said that on a given visit, of the carcasses that were sampled, X amount were from a hatchery.

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MR. TEMPLIN displayed slide 23 and elaborated on the Alaska Hatchery Research Program (AHRP). He explained that AHRP is a collaborative research program between ADF&G and private nonprofit hatchery operators, processors, and other entities. This program was designed to come up with some information that will help interpret observations of [hatchery] stray fish in wild streams. Skipping to slide 25 he related that these large-scale salmon releases have raised concerns for wild stock impacts. Hatchery fish have been observed in wild escapements, it's a concern, and the question is what to do about it. He said a question asked is: "Do hatchery fish detrimentally affect productivity and sustainability of wild stocks?" Generally, it is data limited, he continued. Studies have demonstrated that there are hatchery fish and sometimes larger than expected or from a location that is not expected in these escapements. He pointed out that Alaska's policy mandates there be sustainable productivity from wild stocks and so this question must be answered. It is not a new concern, he stated. Even when the hatchery program was being developed, Alaska at about the same time was developing the very first genetics policy in the U.S. and this policy was finalized in 1985.

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MR. TEMPLIN moved to slide 26 and continued elaborating on the Alaska Hatchery Research Program. He explained that in recognition of the need to examine the extent and impact of hatchery strays on wild stock fitness and productivity, PNP hatchery operators proposed that ADF&G organize a science panel of experts to design and implement a long-term research project to inform future resource management decisions with funding from a partnership of the state, operators, and industry. The science panel developed fundamental questions aimed at examining the extent and potential impacts of hatchery fish straying on fitness of wild stocks focusing on pink and chum salmon in Prince William Sound and chum salmon in Southeast Alaska. The charge to the science panel was to identify priority research questions and develop a framework for research that could be used to address these questions. The panel was made up of 13 members from ADF&G, the National Marine Fisheries Service, the University of Alaska, and aquaculture associations.

MR. TEMPLIN turned to slide 28 and outlined the three questions that were generated by the science panel, the first question being, "What is the genetic stock structure of pink and chum in Prince William Sound and Southeast Alaska?" He said this is important to understand because it provides the background of genetic structure that the results could be measured against to be able to understand the results in context. He related that the panel's second question was, "What is the extent and annual variability of straying?" He said the intent here was to design a program to get answers in a structured way that would then help in understanding how much straying is happening from pink salmon hatcheries into the streams of Prince William Sound. Continuing, he said the third question generated was, "What is the impact of these hatchery fish on the fitness of natural pink and chum salmon?" He noted that "fitness" here is defined as productivity because productivity of the natural system is what is being looked for here.

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MR. TEMPLIN explained that due to time constraints he will not elaborate on the first question. Showing slide 29, he elaborated on the second question about the extent and amount of straying. He explained the graphic depicts straying results for pink and chum in Prince William Sound (PWS) for the years 2013-2015. He explained that each box represents district-wide estimates, not steam estimates, and that each box has three bars, one bar for each year - 2013, 2014, and 2015. The blue portion of each bar depicts the relative proportion of fish from

natural production and the red portion is the proportion of the escapement that came from hatchery strays. He pointed out that there are patterns in pink salmon straying, with more straying in the southwest corner of PWS and less straying in the east side of PWS. A similar pattern is also seen in chum salmon straying, with the most straying of chum in the Montague Island area. There is a large release of chum salmon in that area, he said, and this area was specifically chosen because the streams in that area have not been productive for chum salmon since changes from the [1964] earthquake. For both species the stray proportion of the escapement ranges from almost zero percent to as high as 85 percent [for chum] and 90 percent [for pink]. Of the total escapement for pink salmon overall for PWS, 4.4 percent, 14.8 percent, and 9.5 percent were estimated to be from hatchery origin for the years 2013, 2014, and 2015, respectively. Of the total escapement for chum salmon overall for PWS, 2.8 percent, 3.2 percent, and 3.1 percent were estimated to be from hatchery origin for the years 2013, 2014, and 2015, respectively.

11:52:41 AM

MR. TEMPLIN brought attention to the graphic on slide 30 depicting the straying results for chum salmon in Southeast Alaska for the years 2013-2015. He explained that three regions in Southeast Alaska were estimated. The district-wide hatchery proportion in the escapement for a district ranged from 1.5 percent to as high as [12.7] percent, but overall in Southeast Alaska the total proportion of hatchery fish adding to the escapement of wild fish ranged from 5.5 percent to 9 percent. So, he continued, the distribution, the extent, and the amount of straying is known for these three years in these two regions.

MR. TEMPLIN spoke to the tables on slide 31, explaining that this information can now, for the first time, be used to estimate the actual natural run and actual hatchery run. Before this, he noted, it was very difficult or impossible to estimate how many hatchery fish were in wild escapement. Drawing attention to the lower box on slide 31, he explained that from this total amount, the harvest rate can be estimated. He said that in 2013, "We harvested, or accounted for, 99 percent of the hatchery fish ... and managers were able to do that while only having a 53 percent harvest rate on the ... natural stocks within Prince William Sound." An interesting result from this study, he continued, is that "our current management systems allow us to direct our harvest on hatchery stocks, which are

intended to be for harvest, and at the same time maintain reasonable harvest rates on the natural stocks."

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MR. TEMPLIN displayed slide 32 and elaborated on question three regarding fitness and whether productivity of the natural system is being hurt. He explained that paternity is being looked at to answer this question. Offspring are being traced back to their parents and this is being done in the wild, which has never been done before. The parents are collected in one year and then two years later the fish sampled from that same stream should be the offspring of the parents sampled earlier, and then genetics can be used to do a paternity test and match offspring back to their parents. Otoliths were pulled from those parents to determine whether a parent came from a hatchery or from the natural. Using the otoliths and the offspring, researchers can go back to see what is the relative productivity of a hatchery fish in the wild and what is the relative productivity of a natural fish in the wild and whether they are the same or different. Mr. Templin further explained that five streams were sampled for seven years, 2013-2019. He pointed out that pink salmon are odd and even, so there are two separate lines. There are four observations for the odd years of 2013, 2015, 2017, and 2019, and [three observations] for the even years of 2014, 2016, and 2014. Researchers will be looking not just at children, but hopefully also the grandchildren of the original parents, which will help in understanding how much is potentially environmental and how much is genetic. He noted that this is a large project with an expected 150,000 fish to analyze.

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MR. TEMPLIN turned to slide 33 and stated that researchers have results from one year from one stream, meaning one generation from one stream. He said having these results proves that doing pedigrees in nature is possible. He reported that out of 1,000 fish sampled in the even-year lineage, researchers were able to trace 451 offspring back to 184 parents, which is an offspring assignment rate of 11 percent. The relative return per spawner (RRS) for female hatchery fish productivity compared to wild fish productivity, is about [0.47] for this one year in this one location, so 47 percent hatchery fish. So, he explained, in this sample, hatchery fish are about half as effective as wild fish in the wild. He cautioned that is only one data point and that there are five streams to analyze and there are going to be multiple generations in each of those streams, and therefore it

doesn't settle the question yet because there are still a lot of data points to look at. For male hatchery fish, he continued, the RRS is 87 percent, which is not statistically different than equal. Mr. Templin reported that for the odd-year lineage, 48 offspring were traced back to 20 parents, which is a very small sample size. Only 2.5 percent of the individuals could be traced back to a parent. He stated that under-representation of offspring assigned to hatchery-origin parents is a problem in the studies of both lineages.

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MR. TEMPLIN moved to slide 34 and reviewed the conclusions from this study in Hogan Bay: Hatchery-origin fish did spawn and did produce adult offspring; Hatchery-origin fish spawned with wild-origin fish and other hatchery-origin fish, and those matings produced adult natural-origin fish; On average, hatchery-origin fish produced fewer adult offspring that returned to Hogan Bay and were sampled than their natural-origin conspecifics; There are potentially important differences in relative return per spawner between male and female hatchery-origin fish. He stressed that this is what is known now and that a lot of work is yet to be done.

MR. TEMPLIN addressed how ADF&G interprets the information after it is gathered. Turning to slide 36, he advised that certain questions won't be answered by the Alaska Hatchery Research Program (AHRP). He said these questions include: What are the competition and predation effects of hatchery fish? Do hatchery fish reduce the genetic resilience of wild populations? If changes in productivity are observed, what mechanisms could be driving these differences? How will findings affect policy? [How do these hatchery fish in wild systems affect assessment of escapement?]

MR. TEMPLIN showed slide 37 and advised that ADF&G is assessing the risk. He said information is currently had on wild system productivity and hatchery proportions, and information is being collected on genetic background and relative productivity of hatchery and wild. Once the study is completed and the results are had, it will be time to interpret those results and to understand the implications for management.

12:02:30 PM

MR. TEMPLIN turned to a set of graphs on slide 38 and discussed a study done on the relative return per spawner (RRS) for

steelhead on the Hood River. He said the orange dots on the graphs represent a hatchery female, the blue triangles a hatchery male, and the [solid] black line represents 1.0, so if the dots or triangles are on the solid line, then the [hatchery] fish were equally productive as wild steelhead. He explained the graphs show that [in 1995] the hatchery fish were only about 80 percent as effective as the wild steelhead, [in 1996] the hatchery fish were equally productive as the wild fish, but that lots of variation occurred [during the years 1997-2000]. He therefore pointed out that for Alaska's Hogan Bay there is only the one piece of information, and with a couple more years of information a broader picture of what the RRS means will be had.

MR. TEMPLIN spoke to the mechanisms outlined on slide 39 that drive relative productivity. He pointed out that these effects can last one generation on one side or they can last for many generations. Thought must be given, he advised, as to what are the potential sources of potential risk to wild populations. Displaying slide 40, he discussed the graphic of a conceptual model for assessing risk, explaining that the X axis represents from low to high the probability of something happening and the Y axis represents from low to high the severity of an event. Moving to slide 41, he explained that if the reduction of productivity is about 50 percent, it is in the medium risk range no matter the severity. He said this is one way to start getting an idea and forming the conversation about the risk that hatchery fish might pose.

12:04:36 PM

MR. TEMPLIN drew attention to slide 42 and stated, "It is important for us to be wise consumers of the science." Turning to slide 43 he discussed scientific method, which starts with making observations, then thinking of interesting questions, then formulating hypotheses, and so on. The principles behind the scientific method are to make careful observations; formulate and test hypotheses and those hypotheses must be able to be proven false; refine the hypotheses; and remain skeptical while going through the process to ensure not being fooled. From this process, he explained, theories are then developed and there is a return to making observations.

MR. TEMPLIN reviewed the example of scientific method in practice outlined on slide 44. He said the example is a critical-period hypothesis, which is a theory that is not proven but it is following the scientific process. Observations from ocean surveys and looking at salmon returns indicated something

was happening in the marine environment. Researchers started asking interesting questions: When does that happen? When juveniles first enter the marine environment or after they are coming back? Hypotheses were formulated and then the process is to test the hypothesis, gather data, refine the hypothesis and go around and around in a cycle. Mr. Templin pointed out that the debate in this cycle elevates the science and is part of the scientific method, and this is done before moving to developing grand theories. He said the ramifications of an incomplete scientific process are not always negative, but sometimes it places on the reader the burden to understand the limitations of what the research is telling the reader. He explained that science is stuck in the cycle until some sort of resolution can be made and then at that point the science can move forward.

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MR. TEMPLIN moved to slide 45 and related that a recent paper came out describing pink salmon effects on orca in Puget Sound. Researchers started with observations that the southern resident killer whale population was declining in Puget Sound, there was a two-year pattern [in mortality] for a portion of that, and it was noted that pink salmon have a two-year life cycle. So, the question was asked, Are pink salmon responsible for this pattern [in mortality]? Two hypotheses were presented, the first being that odd-year pink salmon interfere and hurt the [orcas' ability to feed on co-migrating Chinook]; and the second being that because there aren't many even-year pink salmon it helps the orca somehow. The problem with both of those hypotheses, he continued, is that neither one is falsifiable at this point in time. Also, he advised, the second hypothesis is very difficult to distinguish as it is hard to prove that there is no effect.

MR. TEMPLIN displayed slide 46 and noted that the authors of this paper recognized that and wrote: "We recognize the need for additional analyses and rationale to explain this pattern but we wish to facilitate rapid communications of these unique findings because a greater understanding of SRKW [southern resident killer whale] demography enhances the likelihood for advancing their recovery." However, he pointed out, that wasn't the sentence that most people read when reading this paper.

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MR. TEMPLIN moved to slide 47 and continued. He related that what was instead picked up by the news from this paper was that pink salmon had been found to be the new reason for the decline

of killer whales. He stressed this is bad because "we've jumped right from the scientific method, skipped all that bit about refining the hypotheses, collecting information, and gone straight to publication." Showing slide 48, he pointed out that when a word search is done on this paper about whales, the term whale or SRKW comes up multiple times in the various sections of the paper. But when a word search is done for pink, chinook, or salmon, those terms are absent in the introduction, methods, and results sections of the paper, and salmon is in the discussion section of the paper. So, Mr. Templin advised, this paper presents hypotheses but does nothing to advance that and then it was picked up by the news.

MR. TEMPLIN turned to slide 49 and concluded his presentation. He said the responsibility for scientists is to communicate research clearly and effectively. The responsibility for readers is to evaluate the strength of the research paper or of the newspaper article. Mr. Templin pointed out that the peer review process is not perfect. He said the review of manuscripts is voluntary on scientists, reviewers evaluate for science but not for the "splash" factor; publication does not imply full acceptance by the science community; and there are incentives on authors as well as journals to publish papers that make a good news story because it helps generate reputations.

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CHAIR STUTES thanked the presenters and said the information in these presentations will serve as the foundation for coming meetings. She noted that hatcheries have a tremendous effect economically on Alaska, the state's fishermen, and the food supply. The information in these presentations is timely given the discussion at the Board of Fisheries. It is known that straying is occurring, but it isn't known what the effects are. Is straying also occurring within natural populations? Does straying of hatchery fish have any negative effects on wild populations? In certain samples from other studies, she said, reproductive productivity is higher in hatchery fish. Why is that? "The bottom line is we don't know," she continued. "We need more data because there is a lot of open questions and not enough answers. We need to conduct more studies and then be a wise consumer of that science before we jump to conclusions." She stated that this debate needs to be governed by good science and she is pleased that ADF&G and the Board of Fisheries have that same stance and are looking hard at this through that lens.

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ADJOURNMENT

There being no further business before the committee, the House Special Committee on Fisheries meeting was adjourned at 12:12 p.m.