Pink Salmon — *Oncorhynchus gorbuscha*

By Susan McDougall

Nearing the end of its journey to a calm sea, the river seemed to quicken its pace, flowing In great arcs of white-and-green torrents over boulder-strewn rapids. The water pulsed with unreleased energy, tearing at the banks and rolling gravel and stones along the river's bed, an ancient physical force that few mortals could challenge. And yet, if you looked closely, the water appeared to swell in sinuous bumps and turns, as if simmering ever so slightly from an unseen force below. Across this undulating surface, thousands of little fins broke the watery surface. These accents were the fins of the smallest of all salmon — the Pinks. Black from above, sometimes flashing a reddish-green accent, or the tip of a snout, the two-year-old fish were coming home to spawn.

A teenage boy reached into the cold water and grasped a fish. Smiling, the earthbound lad held the fish briefly, then returned the creature to the river and watched as it joined its companions. With strength and determination, each pushed against the flow, responding to a call that the watching humans could never fully understand.

The smallest but most abundant of the Salish Sea salmon, the Pink Salmon's common name refers to its spawning colors. Silvery-blue on the back and pale on the belly during their ocean residency, the mature fish is transformed to warm pinks and cool greens as it returns to its freshwater home. Also called the "Humpback," that descriptive name refers to the large hump, present on the male during the journey up his natal stream. The male also develops a pronounced hooked mouth (the genus name *Oncorhynchus* means "hooked snout"), sometimes so enlarged that he cannot close his jaws.

Aside from the male's hump during spawning season, this species is most easily recognized by the large, black, oval spots visible along the back and sides above the lateral line, and on both lobes of the caudal fin. Adults can reach 30 inches (76 cm) in length and weigh as much as 14 pounds, but more typically on average they are 20 inches (51 cm) long, and approximately 8 pounds. The scales are small and numerous, with as many as 150 along the lateral line.

***Oncorhynchus gorbuscha* — Pink Salmon**

Most common in the north Pacific, the Pink Salmon inhabits waters as far west as the Lena River in Siberia, and east to the Mackenzie River in northern Canada. Along the west coast of North America this species ranges south to La Jolla in southern California but is uncommon in the state.

Pinks have been introduced to many seas throughout the Northern Hemisphere, as well as in freshwater bodies, such as the American Great Lakes. They are present in the White Sea and Barents Sea of northern Europe and have established populations in the Atlantic as far west as

Newfoundland. In Norway, the Pink Salmon has increased in numbers and expanded its range to the extent that it is considered a "high risk" species for its impact on the native Atlantic Salmon (*Salmo salar*.)

From Washington to Alaska along the Pacific coast, Pink Salmon is the most numerous salmon species. In Puget Sound alone about 3.7 million were estimated to have returned to local rivers in 2021; that number could exceed 4 million in 2023. As regular spawning salmon in some of the Strait's rivers, numbers exceeding 300,000 were projected, a substantial increase over previous runs.

However, these large numbers are not a yearly phenomenon— Pink Salmon hatch, mature, and spawn in two-year cycles, and for most of the eastern Pacific, maximum spawning occurs in odd-numbered years.

Retaining their silvery color as they move from the sea towards freshwater, the characteristic pink-and-green spawning colors, and the male's great hump develop as the returning fish reach estuaries in early autumn. Some adults complete their life cycle in this habitat, but most enter coastal rivers and streams.

Now at home, the female searches for suitable gravels in which to deposit her eggs, while the male swims nearby, observing her activity. Finding an acceptable substrate, the female turns onto her side and scoops out a redd (a depression) with her body and tail. In this "nest" she will lay as many as 2,200 eggs. Watched carefully by males, following fertilization the female begins another excavation upstream, pushing gravel over the eggs just laid.

Females may live as long as 20 days after spawning. Hatching occurs in 4-9 months, and the young typically emerge from their protective cover at about an inch in length. They do not linger but rather are carried quickly downstream. Entering the estuary, the juveniles move swiftly to saltwater where they seek the protection of shallow eelgrass beds or migrate seaward as much as 30 miles (50 km). At sea, most of their lives will be spent in relatively shallow waters — 33 ft (10 m) or so — although they will occasionally descend to as much as 243 feet (74 m) below the surface. With a preference for cold waters, Pinks consume a variety of invertebrates and small fish and grow rapidly in their oceanic habitat. Sometimes known to migrate far offshore, they have been observed in streams 400 miles (640 km) from their natal stream.

After their descent to the sea, Pink Salmon remain for only a year-and-a half, maturing quickly over a single winter before beginning their journey back to freshwater. This brief residency accounts for the two-year cycle of the species— it is the shortest for any salmon. In the Strait, their return to the Dungeness River is divided into an upper river population (early) and a larger lower (late) one. The genetically distinct remnant Pink population in the Elwha, formerly confined to the river below the Elwha Dam, has increased to the low thousands, as today the adults travel farther upriver, spawning in tributaries, such as the Little River, and the main channel alike.

Hatchery Supplementation — the Dungeness and the Elwha

Although Pink Salmon are the most numerous of all salmon species, healthy runs coupled with rapid declines in the Salish Sea have defined their reality during the past 50-60 years. These numbers tell a story only partly understood but disturbing in its implications, not only for Pink Salmon but other salmon species as well**.** In 1963, the return of at least 100,000 (and possibly more) spawning adults in the Dungeness River was recorded as a high point for the species. The Pink runs continued to be

numbered in the tens-of-thousands for nearly 20 years, although a persistent decrease, attributed to habitat threats, raised concerns about the stability of the population.

In the Elwha River, the presence of two large dams had suppressed Pink Salmon numbers for 80 years, keeping the species on the brink of extirpation in the river. Meanwhile, the freefall on the Dungeness continued, with fewer than 3,000 spawners recorded in 1981; twelve years later the returning fish numbered less than 2,000. Subsequent returns in the following years included a particularly alarming decline in 2003, attributed to a severe flood on the Dungeness in 2002.

These consistently low numbers in the early years of the 21st century were addressed in part by a request for supplementation with hatchery-produced Pinks. One possible hatchery available for increasing Pink numbers was located on Hurd Creek, a tributary to the Dungeness.

With operations beginning in 1980, the Hurd Creek hatchery is located approximately three miles from the mouth of the Dungeness River. Constructed for the purpose of enhancing salmon runs in response to alarmingly low numbers, hatchery programs at Hurd Creek have historically been in place for the well-known Chinook Salmon as well as Steelhead, Coho, Chum, and the Pinks. Augmentation of the Dungeness Pink Salmon population began in the first decade of the 21st century and has continued to the present.

Pink Salmon eggs at Hurd Creek are collected from odd-year spawning wild fish that return to the Dungeness River. Such an autumn collection and subsequent juvenile production is regulated by agencies responsible for hatchery programs. Released the spring after hatching (even-numbered years) at two sites — the hatchery and the old Dungeness school downriver — the number of first-year fish reached a maximum of over 100,000 in both 2010 and 2012. Releases have declined in more recent years in response to river conditions and saltwater survival rates for both maturing juveniles and migrating adults. Such dynamics in the numbers of adult salmon complicate predictions of both young and mature salmon alike.

Located farther up the river, the Dungeness River hatchery has been a site of Pink Salmon augmentation for more than a hundred years, with historical release numbers varying from approximately 50,000 in 1957, at the Dungeness Hatchery, to over 1,350,000 in 1969; these juveniles were released at Hurd Creek. The broodstock originated in Finch Creek, a Dungeness River tributary.

In the Elwha River, prior to the construction of two dams in the early 20th century, the Pink Salmon population was estimated to be between 400,000 and 600,000 adults. Within less than a hundred years this run had declined to approximately 200 spawning fish. Although it was conjectured that dam removal would in time promote recovery, there was concern about the impact of an increased sediment load on the lower river following the removal of the two dams in 2012 and 2014. Thus, the possibility of extirpation in the river of this once common salmon species prompted the collection of Elwha River returning Pinks during dam removal. Spawned at the Hurd Creek Hatchery and reared to adults at the NOAA Manchester Research Station, in total, intervention took place with three brood cycles (2011, 2013, and 2015) of Elwha Pink Salmon; the smolts were released at the hatchery.

Return to the Elwha

Effectively blocked by dams on the Elwha River for most of the 20th century, the six salmon species (genus *Oncorhynchus*) that had spawned in the river and its tributaries for centuries declined to mere shadows of their former numbers. Completed in 1913, the smaller 108-foot Elwha Dam was located approximately 4.9 miles (7.9 km) from the river mouth. In 1927, construction on the Glines Canyon dam

was finished. Twice the height of the Elwha Dam, this dam was licensed for hydroelectric power generation; the lower Elwha Dam was not.

Although numerically decreased by the two dams, because Pink Salmon typically spawn in lower river reaches, thousands were nevertheless observed below the Elwha Dam in the 1950s and 1960s. However, a bulldozing project designed to improve flood control contributed to the near demise of the Pinks and when the Lower Elwha Klallam Tribe fisheries' personnel began surveys in the 1990s, spawning adults were absent for several years.

In the largest dam removal project ever undertaken in the United States, in 2012 demolition of the Elwha Dam on the lower river was completed, and two years later the final barrier to the emptying of Lake Mills — Glines Canyon Dam — was removed. With the Elwha flowing free once again, hope for the return of wild salmon was born. People began to watch — and count.

As part of the recovery efforts on the river, in 2011 the Lower Elwha Klallam Tribe (LEKT) House of Salmon House hatchery began operation. The goal of hatchery production was to raise Chinook, Coho, and Steelhead for the purpose of augmenting runs and to improve the ecosystems in and along the river. At that time, prior to dam removal, wild salmon spawning activity for all species had been primarily confined to sites below the Elwha Dam.

Except for the collection of spawning salmon during dam removal to preserve nearly extinct runs, Pink Salmon has never been included in the hatchery program at the House of Salmon. Historically, this most numerous salmon species in the river had slid into decline, and ultimately, possible extirpation. Nevertheless, a slow increase in the free-flowing river did begin, the numbers fluctuating, but ticking upward. Still vulnerable, only in the last two spawning cycles (2021, 2023) did the Pinks' return offer hope that this small salmon is back to stay in the Elwha. Importantly, the fish in the river are genetically distinct from nearby populations, including those of the Dungeness River, another encouraging sign for recovery.

In 2021, the Pink Salmon count was approximately 2,000 mature fish. The 2023 return was even more encouraging. As many as 5,000 spawning adults made their appearance that autumn, entering the main Elwha channel and tributaries as well. The Pink Salmon appear to have returned.

Dungeness Pinks

The Dungeness Pinks constitute two runs, an early spawning event from July to September in the upper river, and an autumn one beginning in September in the lower. Spawning numbers have varied widely, with from the high recorded in 1963 sinking to only 6,600 in 1981, following a severe flood. The impact of such an event, which although irregular can be expected, offers some indication of the fragility of this most abundant salmon. Recovery in the Dungeness was slow following the flood; by 1987 the count had fallen to 138. This extremely low number motivated the request for hatchery production of Pink Salmon in the lower river.

A slow but oscillating climb began in the first decade of the 21st century with numbers exceeding 125,000 by 2013 and then declining sharply once again, although not nearly as depressed as in the 1980s. Fewer than 6,500 in 2017, perhaps because of a warming event in the north Pacific — the so-called "blob" — in 2023, the Dungeness River Pink Salmon stock was estimated at approximately 150,000. The reason for this maximum is not clear although it is conjectured that two good La Niña years were a factor.

Pinks — Millions to Billions

In the past, Pink Salmon spawning adults numbered in the millions. Even the Elwha, where all salmon species went into freefall after the building of the two dams in the early 20th century, the Pinks may have numbered more than a million. And it was not just the Elwha that supported so many. Throughout the Salish Sea, Pinks blackened the water in autumn with their anxious bodies, each striving to reach their birthplace in the many rivers that emptied into the sea. They traveled up the Columbia River, spawned in California streams, and from Korea to Siberia thrived in the cold rivers of east Asia. In the mighty Fraser River alone, it is estimated that in the early 20th century, prior to a rockslide in 1914 that interfered with passage upriver, the Pinks numbered about 48 million.

With its two-year life cycle and rapid growth rate, Pink Salmon are clearly a very fecund species, one expected to consistently reappear in odd-numbered, sometimes by the millions. And for thousands of years, this uninterrupted and undisturbed small salmon did just that. While other salmon became memories, the Pinks held on.

Or so it seemed. Today, researching Pink Salmon numbers, both in the past and in 21st century updates, introduces you to yet another worrisome story of species' decline. And the Pinks have not been left out of the picture. A species that once provided sustenance for those who depended on the sea and the rivers, now numbered in the thousands rather than the millions. It was a clear call to action, and one to be addressed by society's most typical approach, one that represented the simplest answer — build a hatchery.

And if you were planning and implementing a hatchery, economically the Pinks were the best salmon species to raise. The two-year cycle meant release could occur in a single spring season. And, regular as a clock, a year-and-a-half later fully mature adults, fattened in a few months in the productive sea, would be back. Or at least some of them. Meanwhile, in the open sea near their hatchery homes, the prolific Pinks could support a robust fishery. Some of those that returned to the hatchery would serve as broodstock.

Authorized to collect eggs, fishery personnel harvested them by the millions; on at least one occasion as many as a billion.

The numbers of hatchery salmon are huge. In 2022 alone, 40 million Alaska hatchery-produced salmon were commercially harvested, a number that rivals ancient runs. That year, Alaska collected 2.1 billion salmon eggs and released 1.9 billion juvenile salmon.

Wild Salmon Decline — The Hatchery Fix — Alaska

In 2022, approximately 23 million hatchery-bred Pink Salmon returned to Prince William Sound, located in Southeast Alaska. This is a region where hatchery salmon outnumber wild salmon; it is estimated that at least 76% in the Sound are hatchery fish. The goal, however, has never been to replace wild ("natural origin") salmon, although the reality of interbreeding is a concern in a place where the numerical balance is so heavily tilted towards hatchery fish. Interestingly, Prince William Sound was historically considered a relatively pristine environment, a place where wild runs were not excessively impacted by habitat loss. How, then, did Prince William Sound become home to so many millions of hatchery-bred Pinks?

Serious hatchery augmentation of salmon began in the 1970s in coastal Alaska where commercial harvest had declined dramatically in the early years of the decade and was a fraction of the highs experienced 40 years before. Worried about the state of the "fishing economy," Alaska's constitution was amended to allow hatchery construction. The idea was not to replace wild fish, but to add to their numbers, to create "healthy, well-managed wild production." Hatchery fish could be harvested, in part paying for hatchery costs and perhaps taking pressure off the declining wild populations.

Today there are 30 hatcheries in the state, most operated by private nonprofit corporations (PNPs), and since the late 1970s growth, while not constant, has increased the commercial salmon harvest to much greater numbers than ever recorded in the past. Wild salmon harvest has accelerated as well, reflecting in part the natural recovery following the decline that led to the acceleration in hatchery production. Commercial take of hatchery salmon has been up-and-down, with a high point in 2013.

The numbers reveal the story, but there is so much data to absorb that at times the overall picture of wild and hatchery salmon throughout the North Pacific is obscured. Salmon production in Asia as well as North America contribute to population counts so large that at first encounter with such figures you might wonder why alarm calls over hatchery contributions to those seemingly robust numbers are made at all. Even the worry over hatchery "strays" inbreeding with natural-origin populations seems less troubling, at least in the northern part of the Pinks' range.

A perusal of some of those numbers is worthwhile nonetheless, if for no other reason than to learn of the role played by hatcheries in the north Pacific today, but most importantly to ask what society intends for the future of this iconic salmon species. Or perhaps the changes wrought by a warming world imply a future for the oceanic species that are beyond the human ability to intervene — or the will.

Big numbers do stand out, and one of the largest is an estimate of Pink Salmon contribution to the biomass in the north Pacific; from 1990-2015 it was 48% of the total amount for three species — the Pink, Chum, and Sockeye. This number exceeded five-and-a-half million tons, with 40% of adult and immature salmon biomass attributed to hatchery production, a number that increased from .9 billion juveniles to 5.1 billion between 1970 and 1990. It is estimated that 15% of the Pink Salmon numbers from 1990 to 2014 were hatchery fish, the majority released in Alaska. During that time, wild Pinks were also at a high point, with approximately 60% originating in Asia. Today, 3 out of 4 salmon in the north Pacific are believed to be Pink Salmon.

In the North Pacific favorable conditions beginning in 1977 contributed to increases in wild salmon and hatchery fish alike, to the point that competition for food at sea may have impacted growth rates as well as survival; this shift also affected species such as seabirds and mammals. It is also possible that an increase in Pink Salmon may negatively impact other species such as Chinook and Chum. These concerns are prompting research into the question of species' dynamics, particularly given the reality of changes wrought by climate change.

South of Alaska

Habitat degradation, overharvest, and other negative consequences of human society have impacted all salmon species along the coast and in the inland waters of the Pacific Northwest. Yet the Pinks seem to have turned the corner from the sharp decline of the latter 20th century, with an estimated 3.9 million in 2021 in Puget Sound alone. This represents a considerable increase from the .9 million recorded in 1977. However, as with other species, the number does not translate directly to size;

in general, the average Pink Salmon weight has been decreasing for several decades. And, as with the concern in Alaska, the question of when an apparently good outcome (an increase in numbers) becomes a less desirable one (pressure on resources) is difficult to answer. In the past, the waters of the Salish Sea and the Pacific Ocean supported fish so numerous that it is difficult to visualize such richness (although the indigenous people of the time might have offered an opinion), but the reality of reduction to the point of threatened and endangered status, as well as concern over so many salmon populations is one that must be considered when evaluating impacts. Such is the case with the Pinks.

Pink Numbers — Too Many Fish?

From 2005 to 2021, Pink Salmon runs in the north Pacific Ocean, a region which encompasses waters from Russia and Japan across the Bering Sea to southeast Alaska, British Columbia, and Washington, reached their historic high: it is estimated that this species now represents 70% of all Pacific salmon. Additionally, hatchery fish account for as much as *40% OF THE TOTAL ADULT AND IMMATURE AND ADULT SALMON BIOMASS IN THE REGION*. Approximately 1.35 billion juvenile Pink Salmon are released each year.

On average, odd-year spawners outnumber even by a factor of 25. This difference provides an opportunity for researchers to evaluate possible impacts of Pink Salmon on other species. While investigating prey, such as zooplankton, squid, and fish, studies also consider air-breathing fauna, including seabirds and mammals. Although fluctuations in prey abundance are not necessarily surprising, and undoubtedly occurred in the past, the cyclical nature of Pink Salmon numbers has provided researchers with convincing evidence of this species' impact on the food web. And it is the extent of correlations between Pink Salmon abundance and other species, particularly the phytoplankton upon which zooplankton feed, that is revealed.

The relationship between Pink Salmon and prey is not always straightforward, and impacts can be positive as well as negative. As an example, when zooplankton decreases because of heavy predation from Pinks, phytoplankton, now subject to less browsing, increases. Studies also reveal that in years when Pink Salmon numbers were reduced, zooplankton increased.

Species that are at an equal or higher level in the food chain than Pink Salmon, also forage on zooplankton, such as herring and perch, and in particular, squid. These cephalopods are an important food for several salmon species, as well as birds and mammals, and are especially subject to predation by maturing Pink Salmon. The fluctuation in squid alone is particularly notable, as they are considered a vital part of the marine food web.

It can be argued that ups-and-downs have always been part of oceanic system dynamics. The concern is over numbers. What happens when balance is lost between species dependent on similar resources?

The implications of Pink Salmon numbers are evident in other, more subtle impacts. As an example, prey consumption by other salmon species points to a Pink factor. Chinook and Sockeye salmon consume less nutritious prey during odd-numbered years, when Pink Salmon growth rate is at a maximum, and culminates in the large spawning event characteristic of the two-year cycle.

Timing of entry from river to sea is also important. As they migrate from freshwater to saltwater Pink Salmon juveniles consume prey in common with other smolts, such as those of Sockeye and Chum Salmon. Competition with Chum Salmon at sea continues during odd years when maturing Pink Salmon are especially abundant, resulting in reduced prey, typically of less caloric value.

Potential side effects of the abundance of Pink Salmon, including the annual input of millions of hatchery fish, are considered by many researchers to *mediate the carrying capacity* of the north Pacific Ocean. Such modifications to a system are referred to as a "top-down" effect, particularly pronounced when a species' abundance undergoes large-scale changes. It implies an interaction with other species that may be indirect, such as, for example, the swings in zooplankton abundance in response to the Pink Salmon odd-year spawning cycle.

Of course, one of the most dramatic changes is the increase in sea temperatures brought on by chemical alterations to the atmosphere. Labeled today as "climate change," the reality now becomes more apparent each year, and the fallout goes beyond bigger storms and rising atmospheric temperatures. The sea, too, is changing.

Warming Seas and the Pinks

Aside from hatchery numbers, fluctuations in odd-year Pink Salmon spawning cycles, and the impact of such factors on other species, evidence that Pinks respond well to an increase in sea surface temperatures adds to concerns about the oceanic food web. It is generally acknowledged by researchers that in the late 1970s a so-called "regime shift" to warmer waters resulted in a cascade of effects on marine ecosystems. While many species declined, in the North Pacific Pink Salmon populations increased, in part due to hatchery production but also in response to sea temperature. On the Strait, the abrupt rise in Pink Salmon numbers in the Dungeness River may in part be a response to the temperature increase.

Whereas warming seas might be good for one species, they may imply a different outcome for others as well as a shift in prey. As an example, for all salmon species increased temperatures create more demands on the body, resulting in a greater need for high caloric food. Particularly of concern are larger species such as the Chinook. All salmon, including the Pink, tend to decrease in size, because competition for food in the new regime ultimately affects them all. Additionally, the large numbers of hatchery fish add to the demands on food supply. And smaller spawning salmon size implies fewer juveniles — large females produce more eggs.

In the second decade of the 21st century, high temperatures coupled with increases in Pink Salmon populations (over 1.34 billion adults in a two-year period) in the North Pacific Ocean may have played a role in the precipitous decline of other salmon species, the largest recorded drop in history. In 2020, harvests declined in the double digits, reflecting suppressed numbers at sea; it is conjectured that such a freefall was not a result of Covid, where fishing was reduced, but rather a decline in fish populations. Low escapement numbers contributed to the worrisome drop.

Enter the Blob — A Temperature Limit?

First detected in 2013, by the winter of 2014, a warming sea event off the southwestern Alaska coast had spread to encompass more than 2,000 miles (3,200 km) of the eastern Pacific, stretching from Alaska to Mexico. Named the "Blob," this increase in temperature was unprecedented, at least in the history of record-keeping — in February of 2014, the water temperature was approximately 2.5° C (4.5° F) warmer than average. By 2015, the Blob had dissipated, but the impact remained. Warming waters in the coastal waters of Washington, and south as far as California, resulted in a loss of phytoplankton and the nutrient-rich zooplankton that eat them. These small creatures are critically important in the salmon diet. And warm water is less productive than cold.

If the observed decline in Pink Salmon numbers is an indication, this abundant species was apparently among those affected by the Blob. The impact was present for more than one spawning odd-year cycle, as smaller fish implied fewer eggs; additionally, a local drought may have contributed to the decline in juvenile numbers. The Blob affected Pink Salmon throughout the North Pacific, resulting in a 2017 "federal disaster" being declared in the Gulf of Alaska for the Pink fishery. The bailout cost the government over $56 million.

Apparently, even the Pink Salmon has its limits for increased temperature tolerances. Perhaps the primary cause is decline in nutritious prey — the decrease in "crunchies" as opposed to the increase of "squishies," as one commentator notes. Yet in 2023, the numbers seem secure, the fisheries are increasing their catch, and the outlook positive. Other forces, such as prices, may be at play, but today the Pinks are numerous indeed.

In The Strait – Loss and Return

It is hard to grasp an increase of more than 145,000 spawning Pinks in 10 years, but that is the case in the Dungeness River. The slow increase began from a low point of less than 2,000 in 1987 to current numbers. However, fluctuations in returns have been consistently worrisome, and in the 1990s petitions were filed under the auspices of the ESA for the listing of two populations, the lower Dungeness River, and the Elwha. Accepting a recommendation by the National Marine Fisheries Service, this petition was denied, the reasoning given that Dungeness Pinks were part of a large Evolutionary Significant Unit (ES).

From a handful of Pinks in the Elwha during the 1980s to numbers in the low thousands, a continuing increase seems a possibility for the river, and certainly a different outcome for what had been considered an extirpated, genetically distinct population.

But the biggest concern over Pink Salmon in the North Pacific is that there are too many, a scenario that affects many species and is exacerbated by the hatchery releases numbering in the millions, particularly in Alaska. Increased competition for food manifests itself in a cascading effect. From Orcas to seabirds to other salmon species, the worry over "too many Pinks" will undoubtedly increase as the ocean continues to warm and recurring heat wave events add to the pressure on all creatures, from the tiniest plankton to the multiple-ton whale, which are dependent on the resources of the sea.

From millions to thousands and back again. What does this mean for Pinks, other salmon species, mammals, birds, and the many other creatures of the oceans as well?

It is difficult to conceive of the numbers of Pink Salmon that thrived in the northern Pacific Ocean prior to changes in the modern era that included large-scale fishing, habitat degradation, and warming waters. If, as some researchers have advocated, the Pinks are more tolerant of increased temperatures, is it possible that this species will dominate on an even larger scale than today? Or will, at some point, the Pacific Ocean waters be too warm to support a food supply adequate even for the Pinks?

The halcyon days of millions of Pink Salmon turning the rivers into a living mass are over. The immediate future for the species seems secure, at least for those born in hatcheries and probably for the wild as well. I remain hopeful that a balance is possible, but it may require commitment and compromise not easily achieved.