The Return of the Blob. A case study in holistic ecology.

Paul Hasselback MD. MSc. FRCPC. Island Health, BC, Canada. Paul.Hasselback@viha.ca

Introduction

Reminiscent of the 1958 indie horror file, the west coast of BC was attacked by "The Blob" in late 2013 and besieged the coast until it finally retreated in mid-2015. The Blob returned to reinvigorate its attack in mid-2018 and as of this writing in January 2019 its status is in limbo[i]. A fascinating hydro-meteorological event of itself it has become known as the Blob as a large floating mass.

Many of us grappled with some of the environmental health impacts that it spawned, without necessarily linking the events together or recognizing their cause. As it returns, we need to ask if this is going to become a recurring event (like El Nino)? And what if any, is the relationship of the Blob as a current day manifestation of our changing climate.

Meet the Monster

The Blob is the descriptive term for a mass of warm water, which at its peak was over 3000 km in length and extended from Alaska to Mexico, with a width of some 2000 km and located off the Pacific coast. The warm water had a depth of 100-300 metres and temperatures within the Blob were often 2.5^{C} warmer than historical averages and at times even warmer. A 2015 sea surface temperature graph shows both the "Blob" and El Nino. (Figure 1)

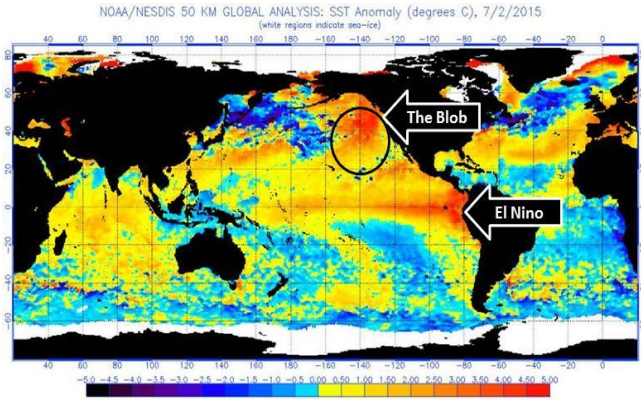

Figure 1. Sea surface temperatures from July 2015 demonstrating both The Blob and El Nino (Adopted from reference XIII (NOAA))

Meteorologists and hydrologists attribute the formation of the warm water mass to a persistent high pressure zone over the Bering Sea/Gulf of Alaska (with a less endearing name of the "Ridiculously Resilient Ridge"). The high pressure area resulted in reducing surface water churning and this led to the elevated surface water temperatures[ii].

The root cause of the changes remain subject to speculation with theories related to a known cyclical change called the Pacific decadel oscillation which is an el Nino like fluctuation usually cycling at over a decade. It is notable that the first attack of the Blob was driven back by the El Nino of 2014-15 as warmer water flowed northward along the Pacific coast from the tropical oscillation event.

The Carnage left by the Blob

The mass of warm water had several immediate implications from the initial attack of the Blob. Air temperatures near the coast were warmer throughout the year. Warmer air temperatures provide for higher moisture amounts. Higher precipitation during the winter months with notable intense wind and rain storms (is this sounding familiar to the 2018-19 storm season?), greater rainfall and lower snow pack formation in coastal regions.

The typically dry summers of the Pacific Coast were drier. Droughts were feared, drinking water systems were concerned about running short on water and the establishment of a provincial drought assessment system[iii] and more harmonization of water conservation messaging (albeit confusion persists as the drought assessment levels do not correspond with conservation levels, and conservation levels may vary between adjacent jurisdictions and water systems).

The 2014-2015 drier summers led to a wildfire filled summers with smoke advisories and problems across the province and the two of the most impactful fire seasons on record. [iv] There are other factors contributing to the upward trends in wildfires, but the warmer water, warmer air and reduced summer precipitation expected in climate change modelling where all in play. Wildfires have become a regular occurrence, literally fueled by pine tree deadwood from pine beetle kills through much of the Interior of the province. The pine beetle infestation is itself a climate change manifestation due to warmer winters – and the combination of factors was synergistically detrimental and contributed to the widespread smoke exposure in addition to the direct damage associated with wildfires. Coastal BC as a rain forest is generally relatively protected from wildfires and yet in 2015 and again in 2018, there were notable wildfires in the area. (Figure 2)

Figure 2. Lizard Lake Fire August 2015 (Adopted from B.C. Wildfire Management Branch)

Warmer water led to changes in extent of algae blooms and species. With the blooms was an increase in domoic acid (cause of amnesic shellfish disease) identifications from harvest areas, and suspected as a factor in increased sea mammal wasting and deaths noted that year. Warmer air and water temperatures led to changes in locations where freshwater algae blooms were noted, and impacted drinking water systems and drinking water quality. The warmer marine waters (Figure 3) were also implicated in changes in salmon runs and harvest volumes. Sightings were made of warmer water species (eg thresher sharks and ocean sunfish) in new northern expansion of their historical ranges. Bleaching in Hawaiian corals was also partially attributed to the blob[v] and partially attributed to sun screen products entering the marine environment[vi].

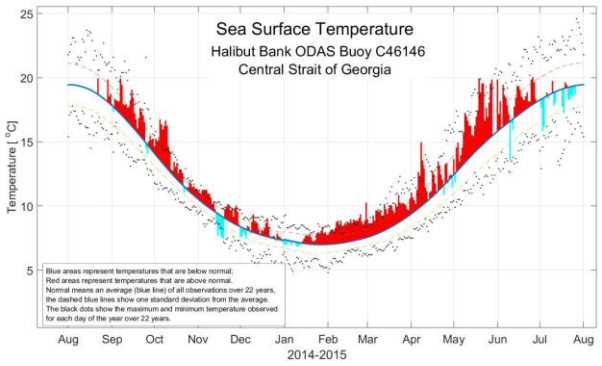

Figure 3. Sea Surface temperature 2014-15, Strait of Georgia. (Adopted from BC centre for Disease Control, Resource Gallery)

2015 was notorious for a well-documented *Vibrio parahemolyticus* outbreak that had negative impacts on the shellfish and restaurant industries and has by some been attributed to warmer waters in the shellfish farm areas[vii] . Those working in coastal environments became very familiar with the outbreaks of shellfish associated Norovirus in late 2016-early 2017 the sources of which remain a point of contention but widely impacted the shellfish industry again[viii] .

Related or not has been the receding of the Arctic sea ice in the Bering Sea which has continued to recede over the past 3 decades with an overall reduction of 2.7% per decade. Ice pack melting, both sea ice and pack ice have been retreating, and is at the confluence of the northern extent of the warmer surface waters [ix].

Perhaps unrelated, although some theories have been postulated to link to water temperatures, is the well documented and studies widespread sea star die off through the same areas of the west coast. Debate continues over the cause of the die off that also began in 2013/14[x]. The consequences of the die off are allowing for an expansion of sea urchin populations. Sea urchins consume kelp [xi]. Kelp is the incubator for many young fish in their development, at a time that sea temperatures may also be affecting fish stocks. In fairness to skeptics, the cycles of sea star wasting disease, sea urchin population explosions and kelp barrens have happened regionally before throughout the globe and may be unrelated. Their potential synergistic impacts of multiple assaults on the marine environment are less predictive based on past experiences.

Those interesting in monitoring progress of the sea surface temperature anomalies are recommended to follow the posted National Oceanography and Aerosmith Administration (NOAA) data reports[xii]. Winter reductions in the surface temperature anomalies were being noted prior to the US partial government shutdown that has put a hiatus into data reporting.

Anticipating the Blob's offspring

We are all obliged to more carefully integrate the data from the changing ecology in BC coastal waters as it impacts human wellbeing in all its manifestations. There is likely a strong role for citizen science in noting these impacts, in addition to augmenting existing research agendas.

We can also begin to ask the questions about whether we are asking the right questions. We have considerable strength in issues based surveillance and research in changes over time for issues like impacts on fish stocks, changes in sea mammal populations, even researchers focused on sea stars and plankton monitoring programs. We have strong research and monitoring in meteorology and some experience in monitoring the impacts of sea water changes through decades of El Nino/La Nina oscillations. Climate change research has focused on the expected future state conditions and possible single issue impacts. Where we have room to build is on monitoring and research of complex environmental changes and their human health impacts.

The Blob may be a passing anomaly unrelated to a changing global climate, it may be a recurrent local condition that has only been recently documented, or it may be a flagrant demonstration of what climate change has and will herald. In this respect it is a living laboratory. Optimistically, resilient marine environments may adapt as they have done innumerable times in the past and are a measure of a healthy environment. If the combined impacts have impacted ecological wellbeing, recovery may be prolonged or even unsuccessful. Irrespective, the changes to local ecology will carry with it changes to normal human patterns particularly in relation to harvesting of marine and traditional foods. On land, humans assert greater control over manipulation of the environment and will be challenged to adapt to changes in temperature, precipitation, drought and wildfires amongst other noted impacts.

Consider this a plea for holistic assessment of our ecological health. Complex/wicked problems will not be solved by simple solutions. Even in the absence of any solution, adaptation will require holistic approaches that consider the multitude of impacts as the regional ecology continues to be modified.

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