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Behavioral biology
December 5, 2011

Grizzly Bears of Yellowstone National Park

I have chosen to look at the grizzly bear population of Yellowstone National Park. The grizzly population of Yellowstone was put back on the endangered list in 2009 mainly due to environmental factors limiting the availability of food. I will examine how serious this threat is and what methods are most effective in order to combat this problem. My hypothesis is that the grizzly bear can adapt to changing availability of food and new diets, as long as there is sufficient amount of land provided.

The grizzly bear can be found from the Arctic coast down into the central parts of Europe and Asia. In North America it can be found in Alaska, western Canada, and smaller populations in the United States. It used to be found along most of the west coast of the United States, from Mexico to Alaska, between the Pacific Ocean and the Great Plains ("Grizzly Bear"). In the early 1800s there were at least 50,000 bears, but after extensive hunting and loss of habitat, the number drastically declined. In 1975 the grizzly bear was listed as an endangered species. There are six recovery areas in the U.S., Yellowstone National Park being one of them. In 2007 the Yellowstone grizzly population was considered recovered and was taken off the endangered species list ("Grizzly Bear Recovery"). In 2009 however the Yellowstone grizzly was put back on the list, as the population in recent years has declined again. The decline of whitebark pine due to climate change was stated as the primary reason. Today there are about 1,200 individuals in the United States, and about 600 of them located in the Yellowstone area (Sauders et al. 2011, "Grizzly Bear Recovery"). The grizzly bear is an omnivore whose diet changes significantly throughout the season. Mating season is between May and July, and cubs are born between January and March. The bear goes into its den in the late fall and stays there until early spring. It is not really in hibernation and can easily be woken up. Its fat deposits allow it to stay in the den without food over the winter ("Grizzly Bear").

In the early and mid-20th century the grizzlies were roaming very close to campgrounds and restaurants in the Yellowstone park, using human garbage as one of their main food sources. This close proximity to humans posed a deadly threat and the number of grizzly attacks on humans was very high. In 1968 the National Park Service decided to close the garbage dumps along with teaching the park visitors to not leave any food around. This process began in 1968, and in 1970 there was hardly any garbage for the bears to be found (Craighead 1998, Robbins et al. 2006). The result of this garbage closure led to the bears moving even closer into the campgrounds, posing a threat to humans, and therefore being killed. John J. Craighead explains in his paper from 1998 that he along with others warned the park managers about the possible consequences of such a rapid closure of the garbage pits. Over half of the Yellowstone grizzly population died within the four following years. Being down to less than 200 individuals, the grizzly was put on the list as an endangered species in 1975. The surviving bears eventually found new key food sources, forbs being the main one. However research showed that for more than a decade after the garbage closure, the bears were under nutritional stress and had declining

growth rate. It was not until the mid-1980s that values equal to those before the garbage closure could be observed (Craighead 1998).

How could this disastrous outcome have been prevented? Human garbage is not one of the grizzly's natural food sources, yet they suffered severely when it was taken away from them. Does that tell us that they grizzly does not adapt well to nutritional changes, and should be a prediction for future forced dietary changes due to for example the climate change? Before answering the last question it is important to first get a full understanding of the natural eating habits of the grizzly.

The article written by Mattson et al. on food habits of the Yellowstone grizzly gives a detailed description of their diets throughout the seasons. Ungulates comprise a large portion of their diet in the spring but also some during the fall. Cutthroat trout is the main food source in June and July. "Trout were used almost wholly while spawning in streams entering Yellowstone Lake" (Mattson et al. 1991). They found that graminoids were large part of their diet in May and June but also consumed during other months, and horsetails mainly in June and July. Roots made up a relatively high portion during all of the months. Fleshy fruits were consumed primarily in August. Whitebark pine seeds made up a substantial portion of their diet from May to October with the largest amounts in September and October. Human garbage and domestic livestock makes up a small part of their diet between July and September and other small components of their diet are rodent, insects, and mushrooms. August is the month where the grizzly bear has the most diverse diet as many different food sources are available. The authors found large differences in diets not only between different seasons, but also between different years. Since the bears have such wide range of diet, they were able to adopt new food sources when their original food was scarce. However depending on the time of the year, this was achieved more easily at certain times than others (Mattson).

The research becomes credible as it spanned over such long time as eleven years. The authors believe that the fleshy fruits play the most important part of the diet related survival with the second most important factor being the whitebark pine seeds. I don't fully understand that reasoning since the fleshy fruit is primarily eaten during August when there are several other food sources available. The whitebark pine seed seems like it should be the most important source, since it is one of the few sources available in the fall. Also its high fat content is important for the bear in order to build up fat deposits for the winter.

Charles T. Robbins et al. give an interesting presentation on the changes in diets of the grizzly in his paper from 2006. They take the research to a new level where they do not just look at changes over the span of a decade or so, but over the entire millennia. Obviously scat analysis is not here enough, so the use of stable isotope and DNA analysis have been used to compare the remains of the thousand year old animals to the ones living today.

1000 years ago, the grizzly bears located in Yellowstone had a diet of 32% meat and 68% plants. Where salmon was available, it made up 60% of the annual food content. In the 1900s before garbage dumps were closed the bears switched to a diet of 85% meat and 15% plants. When the garbage no longer was an available food source, the ratio switched back to where it was before. Previous research states that

males have a more carnivorous diet than females due to the fact that they are stronger and have an easier time killing elk and bison. On the contrary trout has been consumed more by females, and Robbin's report suggests that it is because of the nutritional demands of the mothers with cubs."Grizzly bear mothers with new cubs benefit from good food resources when they emerge from their winter dens. Studies at the Washington State University Bear Center determined that grizzly bear milk has 4.5 times more fat and 17 times more protein than human milk. While each cub consumes about three-quarters of a pint per day of this very concentrated milk during hibernation, mothers must quadruple milk production to sustain the increased growth of cubs once they emerge from the winter den" (Robbins et al. 2006). New research found that males were now consuming five times more cutthroat trout than females were. The report did not include the reason for this change, but explained plans on further research over a four-year period. To my knowledge, the findings are not yet published. Illegal introduction of lake trout has caused a decline in the cutthroat trout population. The lake trout is a predator and each lake trout consumes about 50 to 90 cutthroat trout annually. The lake trout spawns in the deep waters of the lake, which makes them impossible for the grizzlies to catch (Robbins).

My suggestion which is the same as Robbin's planned hypothesis, is that when there is an unlimited amount of cutthroat trout available, females will use it as a larger portion of their diets than males will. However when the numbers decline below what is necessary to meet the needs of all bears, the stronger and more dominant males will have a larger chance of using this food source.

The whitebark pine which is large part of the grizzly's diet, is threatened by the climate change. The pine nuts contain important fat needed for the bears to endure the winter. Years where there has been good production of pine nuts, females have been seen to give birth to three cubs compared to one or two cubs those years with little pine nut availability. Years where there is high production of the pine seeds, the bears are located at higher elevations where the whitebark pine trees are mainly to be found. Years of low production of the pine seeds, the bears have been able to consume the roots of the tree instead. The climate change however is posing a threat to the entire tree as it becomes susceptible for blister rust infection and beetle infestation (Robbin).

It seems like we have found the answer to our question. The grizzly bear has a very large range of diet and selects its food based on availability. Our next question then is if there are enough alternative food sources for the grizzly, to replace the cutthroat trout and the whitebark pine tree with.

The article written by Schwartz et al. about hazards affecting the Yellowstone grizzly states human disturbances as the main factor for Grizzly mortality in the Yellowstone area. The authors explain how the lack in key food sources such as the whitebark pine causes the grizzly to move to lower elevations. They suggest that this shift in habitat in itself is not a direct threat for the bears, but the indirect cause of closer proximity to humans is. "Bears that shift to lower elevations that have been altered by human disturbance (e.g., more roads, developments, homes) are exposed to more risk, whereas bears that shift to lower elevations in habitats that are secure are not subject to increased hazards and thus survive."The article also explains how during years with low availability of whitebark pine seeds, the bears "transitioned from pine seeds to meet." This in turn caused the bears to move to areas which were also available for game hunting and were there threatened by hunting related deaths. The positive sides of

this research were that they unlike previous reports on Yellowstone mortality studied the entire Yellowstone area and not only the grizzly bear recovery zone. The recovery zone only represents 61% of the full grizzly population of the Yellowstone Park. The not so positive aspect of their study is that they rely very much on previous findings instead of carrying out their own original research. They state their main goal as to find the reasons for mortality, yet one third of the 75 mortality cases they studied and based their conclusions on were unknown or censored. The author discusses how previous data lacked the explanation of reasons for mortality, yet they use most of their data from this previous published research. They also state that there was a higher survival rate among females than among males, but they fail to explain why or even offer a discussion on why this could be the case. The research includes the study of the effect of roads and other human developments. Yet they excluded developments such as parking lots and airports, stating that they were not potentially lethal to bears. The weakest point in this research has to be the lack of definition of human disturbances. It becomes pretty clear that their definition is the direct cause of death by a human, such as a bear getting killed by a car or by a human in self-defense or by accident while hunting. This seems clear because of their decision of not considering developments such as airports or parking lots as factors for the survival. The authors should have taken into consideration that any development compromises the grizzly bear's natural habitat and is a possible threat for its survival. What about the fact that shrinking habitat may cause higher killings within the bear population itself as individuals are forced to co-exist more densely?

In 1993 there was an initiative started to create a safe passage for wildlife from Yellowstone park to the Yukon territory in western Canada. They recognized that originally the grizzly had a range as wide as from Mexico to Alaska and in order to give the grizzly an honest chance of recovery, its habitat has to be expanded beyond its current limits. It is still in the process of fulfilling its goals, but large areas of land have been purchased by the organization behind the initiative to be protected and used for the wildlife. They explain how in order for the grizzly populations to prosper, it is important they stay interconnected with each other. This requires the ability of the bears to travel throughout much of the landscape, regardless of its use by humans (Francis 2011).

It is obvious that the climate change is a real threat for the grizzlies of Yellowstone park. However I don't think it's very productive to focus our attention to such small aspect of the problem when we should look at the larger picture. We know that the grizzly is well capable of adapting to changing availability of food sources. We know that in the past such changes have caused detrimental population losses, but not due to the lack of the grizzly's adaptability, but because of human interference. It seems that people living or spending time in or around the Yellowstone park should be aware of its wildlife and how to coexist with it. There has to be an alternative to killing the bears when they come too close to a residential area or campground. If we truly have an interest in saving these animals we have to understand their need for large and diverse habitat, and provide it. I think the "Yellowstone to Yukon" initiative is a great way of trying to solve the problem. As long as the grizzly is limited to the park's borders it will be much more vulnerable to any changes. Another solution that could offer results quicker is revision of the human interactions within the park. When the pine seeds aren't available in the fall, the bears move to areas holding more ungulates to hunt for meat. Here they become a target for hunters, so this poses a big threat for them to get killed. It seems like a very simple solution would be to stop the

human hunting for ungulates and allow the grizzlies to hunt instead. I definitely think there is a possibility to protect the grizzlies, as long as we take all factors into consideration and not just the ones staring right at us.

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