Natural and houman life in mono lake

Science, Geography

Natural and Human Life in Mono Lake Mono Lake is notable for being a harsh environment to many species as d by Carle (58). The high level of salinity and alkalinity of the lake renders it unsuitable for habitation by fish. In this respect, the lake has no fish and cannot sustain many aquatic species that occupy waters that are friendly to fishes. Even though Mono Lake is harsh to many species, it is a rich ecosystem in itself. Several species depend on Mono Lake and its surrounding environment to find their food, and as a habitat.

One of the species that find the Mono Lake conducive for living is the alkali fly. While many species find the lake unfavorable for life due to its high pH and alkalinity, the alkali flies find a lot of benefit in these conditions (Herbst1& Bradley1 670). The water of the lake provides a natural breeding ground to the flies much as it provides good ground for feeding as it is filled with different kinds of algae; blue and green (Herbst1& Bradley1 670).

Many species of birds live around Mono Lake and many others travel from as far as South America and take time to rest and rejuvenate on as they migrate from different places. The birds mostly find the Mono Lake a suitable ground for breeding as there is plentiful supply of food in the form of alkali flies and brine shrimps, especially between mid summer and fall (Cash & Bradley 312). It is estimated that over 100 bird species in totaling millions grace the Mono lake area at different times of the year (Mono Basin Ecosystem Study Committee of the National Research Council 46). It is estimated that more than 44, 000 California Gulls find breeding ground around the lake in spring every year (Mono Basin Ecosystem Study Committee of the National Research Council 46). Some of the birds that are found in the wider Mono Lake region include red-necked phalaropes, flamingoes, egrets, Wilsons phalaropes, horned lark , bank swallow, dusky flycatcher, stellers jay, scrub jay and eared grebes, to name but a few. While the population of water fowls such as ducks was high in the lake several decades ago, this is no longer the case. The ducks, Gadwalls, Geese, Mallards, and Green-winged Teals have almost disappeared over the years as a consequence of the diversion of the river that flowed into the lake in 1941.

Humans have lived in the Mono Lake region for a long time. The Kutzadikaa people find benefit from the lake in that they normally hunt alkali flies for food during winter periods as noted by Herbst and Bradley (193). For the different bird species and the tufa mounds that are found in the Mono Lake area, many people find the place a tourist attraction site (Ford & Pedley, 123). Human activities have, however, grossly the lake and its ecosystem over the years. The diversion of river that feeds the lake some time in the 1940s has seen the Lake’s level reduce and, consequently, the population of some bird species decline. Furthermore, tourists and locals pollute the Mono Lake environment by throwing such things as polythene bags, plastic containers, tins, and cans in and along the shores of the lake.

Alkali Flies in Mono Lake

Mono Lake is one of the most visible lakes in the state of California, according to Nixon (17). Located in Mono County, Mono Lake acts as an important tourist attraction site in the state. Unlike other lakes in California, Mono Lake has numerous unique species of flies, birds, and organisms. Alkali fly also known as brine fly is the most visible type of insect found in the lake.

Geologists argue that the rare fly thrives well in the Mono Lake since the lake provides a suitable breeding ground for it. Research indicates that the lake acts as a breeding ground to thousands of alkali flies. The lake provides saline and alkaline conditions that favor the alkali fly to a great extent while disfavoring many organisms that may otherwise compete with the flies for food, space and other resources. While they are not subject to much competition in their natural habitat, the alkali flies are food to predators such as birds and humans. The flies also face a threat from certain environmental conditions such as water currents, waves, extremely high alkaline conditions, and cold temperatures.

Description of the Species

Alkali flies, also known as, brine flies or Ephydrahians, are a very rare species to find. This is attributable to the fact that the species breeds well only in certain habitats, especially in alkaline waters. This probably explains why the insect is called the alkali fly. Found in Mono Lake, California, the fly breeds well on the surface, shorelines, as well as beneath the lake (Cash & Bradley 312). Most of these species of flies are dark brown in color with an adult measuring between 4 to 7 mm long. The fly has a segmented thorax, which is bluish in color, while the wings are brownish in color. Unlike the ordinary flies, alkali flies normally spend most of their life circles entirely beneath the water surface. This makes the fly unique in addition to the fact that it breeds well in alkaline environment. This paper discusses the Mono Lake alkali fly including its habitat, natural existence, and environmental factors that impact on its survival.

Reason Why Mono Lake is a Preferred Habitat for the Alkali Fly

Mono Lake is one of the most dominant lakes in California. Circular in shape, Mono Lake draws most of its waters from the surrounding streams. However, since the lake has no outlet, the lake is highly alkaline (Jiang, Steward, Jellison, Chu & Choi 19). This is attributable to the continuous accumulation of salt in the lake. A research conducted more than three decades ago indicated a correlation between the alkalinity of Mono Lake and the availability of alkali flies. According to the research, the alkalinity of Mono Lake provides a suitable breeding ground for alkali flies.

Other researchers have also demonstrated that the salinity and alkalinity of Mono Lake has a huge impact on the algae found on the lake (Mono Basin Ecosystem Study Committee of the National Research Council & National Academy of Sciences 6; Herbst1& Bradley1 677). The presence of these algae on the lake also influences the growth and development of alkali-fly. According to Wiens, Patten and Botkin (595), the salinity of the lake makes it difficult for algae to thrive. This leads to a reduction in the number of algae in Mono Lake, thereby compelling larvae to utilize high amount of energy to rummage. This normally leaves very little osmoregualation to take place. Most species have no capacity to survive in highly saline water. However, alkali flies breed well in Mono Lake because the lake has a balance of alkalinity and salinity. Research conducted on the lake revealed that the alkaline concentration in Mono Lake is caused by both carbonate and bicarbonate ions drawn into the lake (Nixon 18). As earlier stated, Mono Lake, has only inlets, and no outlets. As a result, all the carbonate and bicarbonate ions drawn into the lake ends up accumulating, resulting in increased alkalinity. The tributaries of mono lake include Rush Creek, Lee Vining Creek, and Mill Creek which flows through Lundy Canyon (United Nations Environment Programme 12).

Alkali flies tend to survive better in waters that are highly alkaline. At mono lake for example, the concentration of carbonate and bicarbonate ions is extremely high, making up about 40% of the dissolved solids as noted by Herbst2 (194). Across the world, there is no lake that is higher in alkali levels that supports insect life. The alkali fly thrives in an highly saline environment. The level of salinity of the lake's water directly affects the growth and development of the alkali fly and their rates of development. When the water is highly saline, the population of algae reduces and the larvae are forced to use more energy for foraging. This leaves little room for the occurrence of osmoregulation which makes it possible for the alkali fly to balance the quantity of salty in their bodies.

Mono Lake Alkali Fly Life Cycle

The Mono Lake alkali fly is an insect. Like all other insects, its typical life cycle involves developing from an egg to a larva and then to a pupa before undergoing a metamorphosis to become an adult that is capable of reproducing. For the alkali fly, the life cycle begins when a female fly that has mated with a male fly crawls beneath the water surface and goes to lay her eggs on substrate or benthic algal mats near the shore of the lake (Herbst1 25). The eggs do not float but remain at the bottom of the lake because there are more dense compared to the water of the lake. To further ensure that the eggs are safe and have higher chances of hatching, the female fly may tuck her eggs into the algal mat. The egg of the mono lake alkali fly assumes the shape of a football and is about 0. 2 mm wide and about 0. 8 mm long, on average according to Herbst2 (103).

The eggs hatch within a period of between one and three days depending on the temperature and salinity of the water (Herbst1 102). The larvae that is hatched from the egg undergo a series of developmental stages, shedding their old skin between the stages (the first, second, and third instars). Depending on several factors including the temperature, salinity, amount of food available, and the quality of food that they feed on, the larvae takes between four and 20 weeks to get into the pupal stage (Herbst1 & Bradley1 671). Research shows that when the temperature of water is maintained at 20OC, development of the larvae in the first instars takes four days, the second instars, seven days, and the third instars, 14 days (Herbst1 & Bradley1671). In the natural environment, temperatures usually vary greatly which affects the rate of development of organisms. This also applies to Mono Lake where temperatures are always below 200C which means that the alkali flies take longer to develop.

At the end of the larva stage, the mature larva attaches itself to the underside of a stone using clamp-like claws. An ideal location for spending away the inactive pupal stage is where it is lee likely to be dislodged by turbulent water (Herbst1 114). In the event that the pupa is dislodged from its location, it gets to float to the surface given that the puparium is always filled with air. The larva forms a case around it to form a pupa. The organism remains inactive as it goes through a complete structural change to emerge within three weeks as an adult fly.

At the end of the pupal stage, the adult Mono Lake alkali fly floats to the surface of the lake enclosed in a bubble of air. Most of the adult life of the fly is spent along the shores of the lake where it feeds on algae and detrital sources of food. Part of the life of the adult alkali fly is dedicated to procreation with males and females mating randomly. The female fly lays 10 eggs on average over a two-week duration and go beneath the water surface to the benthic algal mats where they deposit their eggs (Herbst1& Bradley1 671). The adult fly lives for between 10 and 14 days but can live longer during winter.

Tufa Mounds in Mono Lake

Mono Lake situated in Mono County, California is known for its high levels of salinity and alkalinity (Tierney 46). As a direct consequence of these factors, the lake hosts very few flora and fauna. Apart from its alkali flies, Mono Lake is reputable for its tufa mounds as noted by Carle (65). Tufa mounds line the shores of Mono Lake as well as occur beneath its waters (Ford &Pedley 124). This paper will discuss the tufa formations found in Mono Lake California. Tufa is a kind of limestone that is formed under ambient conditions in water bodies. The formations result from the precipitation of carbonate minerals in lacustrine settings or fluvial channels. At Mono Lake, several tufa mounds tower above the water having rugged surfaces and taking on different shapes and sizes. Although they are distributed around Mono Lake, they are mostly concentrated at the South Tufa grove, at the south end of the lake. While tufa mounds grow exclusively under water, they are quite visible along the shores of Mono Lake (Bethke& Hay 257). This is the case following the decline in the lake’s level. The level of water at Mono Lake has been on a steady decline sine 1941 following the diversion of some of its sources for residential and commercial use.

Tufa mounds that occur in the lake or along its shores form in different ways (Ford &Pedley 134). One of the ways fufa forms is when the lake’s water that has a high concentration of carbonates mixes with water from underground springs that are rich in calcium (Pedley 149). When the two chemicals get into contact, they often react to form calcium carbonate or what is commonly known as limestone. At Mono Lake, a similar reaction occurs when the waters from different sources and having calcium and carbonates mix (Zhang, Zhang, Zhu& Cheng 214). The calcium carbonate so formed precipitates near the under water springs and grow over several years to form the fufa mounds.

Tufa formations also form away from under water springs. In this respect, crystals of calcium carbonate precipitate out of Mono Lake’s water and form coats around surfaces at the bottom of the lake (Pedley 151). Some of the objects that are coated by the compound include dead vegetation, pumice rocks, dead birds, and man-made materials such as plastic and metallic containers among others. Tufa columns also grow out of the life processes of alkali flies, a common phenomenon at Mono Lake. During its pupal stage, the alkali fly encases itself in a shell made of calcium carbonate. The pupa attaches itself on a rock beneath the water surface so that it is not swept away by waves or water currents that commonly rock the lake. When the adult fly finally emerges from the case at the end of the pupal stage, it floats to the surface leaving behind a small deposit of calcium carbonate in the lake. While this phenomenon does not contribute to the growth of tufa mounds to a great extent, it is one way through which the mounds grow.

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