

Biological conditions, productivity features of lotic environments, Influence of currents, Plant growths

Biological conditions

The range of conditions is reflected in the biota which varies from distinctly characteristic organisms to lentic flora and fauna of the system. The greater the current velocity, the greater will be the divergence of lentic and lotic populations. The lotic assemblages occupy the upper elevated positions of stream system. Certain groups of animal exclusively lotic ones such as stone-fly larvae (Plecoptera), black-fly larvae (Simuliidae) etc. are restricted to running water series. Generally it is said that the lotic populations are more restricted in the number of species.

Productivity features of lotic environments

The quantitative features of plankton and productivity of the microorganisms are very important in the lotic series of water bodies. According to Needham (1930), the ecology of the smaller streams especially brooks and creeks have general features and they are :

1. Distribution of aquatic animals in brooks and creeks are dependent largely upon
 - a) temperature of the water
 - b) nature of the bottom
 - c) velocity of current
2. Smaller streams from the source of mouth have 2 distinct types of habitats such as pools and riffles
3. Riffle bottoms greatly exceed the pool bottom in productivity
4. Fishes in brooks and creeks tend to seek the pools. Pools act as catch basins for animals brought down from the riffles and these drift animals serve as food for pool fishes.
5. Absences of higher aquatic vegetation leading to productive silt bottom for small organisms
6. Plant beds in smaller streams markedly affect productivity. Stream bottom supporting growths of aquatic plants were found seven times more productive than stream bottoms bare of vegetation.
7. Small cold, headwater streams less than 7 ft are more productive (twice) than the maximum width.

Influence of current

Lotic fauna is typically composed of animals whose dissolved oxygen demand is fulfilled by the oxygenated waters of streams. In some forms, the requirement of inherent current demand is more when compared to oxygen demand in lotic environment. The gill area of May fly nymphs in mountain streams varied inversely with the dissolved oxygen content, but not close relation with the current rate. Some organisms are more dependent upon the increased amount of dissolved oxygen and the mineral salts in solution than upon current. In certain May fly nymphs and caddis – fly larvae from a swift stream, the oxygen consumption is higher than the closely related, equal sized nymphs and caddis – fly larvae from a pond. The same situation is exit in aquatic crustaceans (*Asellus aquaticus*), where swift stream consume more oxygen than that of sluggish flowing water. Nymphs are less resistance to oxygen deficiency than those in quiet water. Running water animals seek certain physico-chemical conditions and are compelled to tolerate current as a mechanical condition against which they struggle. With the exception of the plankton, all other biota have developed means of maintaining themselves (except during floods) in the streams have adopted to thrive well and even exist. Among organisms of running waters, the character facilitating to maintain their

position is diversified. Some of the insect larvae build heavier cases in running water than the quiet water. An accompanying feature of current is molar action. The action and severity of this vary widely with current velocity, the nature of the bottom materials and other circumstances. Injury and mortality may be very high at times of flood. In addition to molar action, eroding and scouring action of flood waters often depopulate the streams, so that restocking is necessary. Nature has numerous and effective means of restocking populations such as upstream or down stream migration of animals from adjacent waters, transportation by currents, reproduction by the individuals, spread of aerial adults from nearby waters and transportation as wind-blown materials. The production of drift materials in a stream is one of the invariable effects of the current, even in the absence of floods. A phenomenon arising out of current action is the depositions of eroded silt. In some lotic conditions, e.g. Instep, rock bed streams such deposits are absent. Certain organisms regularly occupy regions of silt deposit with no detrimental effects. Some of the organisms possess certain mechanical means of avoiding suffocation by the mud. Another influence of current is the elimination of surface breathers except in the very slow moving regions.

Plant growth

The larger aquatic plants do not occur in stream except where the current is greatly reduced. Occasionally, certain rooted plants (Chara and others) may be found in rapid streams. There is distinct tendency to dwarfing in plants that grow in mountain streams. Certain water mosses are found in rapid current, especially in streams not subject to severe floods. Sometimes, it is also important to note that slow moving sluggish streams become plant choked maintaining flora composed of submerged and floating types of plants. In the slower water of stream edges, a narrow margin of aquatic plants occur but with limited success. The plants provide benefits in fish production owing to supply shelter, protection for young ones, abundance of food; aquatic invertebrates which are sometimes become food for fishes.

Algae of swift streams possess the holdfast cells or other structures to support over any substratum and to remain there against the strong current. The fresh water red algae, Lamanea is found only in rapid waterfalls. Green algae, Cladophora, attaches to stones and other supports in slow streams. Certain other algae which lack holdfasts resist current action because of abundant mucous secretion.