Metal pollution of water and its sources has been receiving considerable attention of late due to the increasing amounts of industrial effluents discharged into the environment. A large number of metal ions in soluble forms are let out into the water bodies by several industries and most of these metal ions possess toxicity, causing health hazards to living beings including humans. Metals like Hg, Pb, Fe, Cd, Cr, Cu, Zn and As in their common oxidation states are reported to cause several physiological disorders. Due to the necessity of them at micro levels, national and international agencies have prescribed tolerance limits for these metal ions. Several reclamation technologies have been developed to reduce their concentration. A number of cheap and indigenous materials are identified as successful adsorbents, which remove metal ions through the process of adsorption. Chitin and chitosan, two naturally occurring polymeric materials, are found to possess excellent adsorption capacity and hence are employed as potential chelating agents to reduce the concentration of four selected metal ions. These biopolymers have additional qualities in terms of biocompatibility, biodegradability, economic viability, non-toxicity and easy availability which make them successful metal scavengers. Adsorption studies of iron(III), copper(II), zinc(II) and chromium(VI) by chitin and chitosan have been investigated. The optimum conditions for achieving maximum adsorption of metal ions are established. The factors which influence the adsorption rate by the materials and the dynamics of adsorption process are studied in order to verify the adsorption behaviour. The nature of adsorption is explained in terms of fraction of adsorption, intraparticle diffusion and also using isotherms. An assessment of the comparative ability of the two polymers along with the order of preferential adsorption among the metal ions is made on the basis of the valid conclusions drawn from the experimental results.