Plasma membrane preparations of gills contain two Ca$^{2+}$-dependent phosphatase activities. Ca$^{2+}$-activated ATP hydrolytic activity, often reported as Ca$^{2+}$-ATPase in literature on fish gills, was identified as a heterogeneous, nonspecific phosphatase that i.a. hydrolyzes Ca$^{2+}$-ATP. We further identified a homogeneous, high-affinity, calmodulin-dependent (Ca$^{2+}$ + Mg$^{2+}$)-ATPase ($K_{m}$: 0.22 μM Ca$^{2+}$, $V_{max}$: 5.41 μmol P, hr$^{-1}$ mg protein$^{-1}$). We consider the latter ATPase activity to be directly involved in active transepithelial transport of Ca$^{2+}$. In eels exposed for 3 weeks to low-calcium fresh water (0.1 mM Ca$^{2+}$; controls, 1.5 mM Ca$^{2+}$) branchial plasma membrane-specific activities for Na$^{+}$/K$^{+}$-ATPase, Ca$^{2+}$-ATP hydrolyzing phosphatase, and high-affinity (Ca$^{2+}$ + Mg$^{2+}$)-ATPase were increased 26, 52, and 161%, respectively. Reduction of environmental calcium is known to increase branchial permeability for mono- and divalent ions. The resulting passive loss of ions will likely be compensated for by increased branchial active uptake of ions like Na$^{+}$ and Ca$^{2+}$. This may explain the enhanced Na$^{+}$/K$^{+}$-ATPase and high-affinity (Ca$^{2+}$ + Mg$^{2+}$)-ATPase activity. The nonspecific phosphatase activities may be related to ion transport phenomena (permeability control?). Prolactin treatment of freshwater eels increased the high-affinity (Ca$^{2+}$ + Mg$^{2+}$)-ATPase activity without affecting Na$^{+}$/K$^{+}$-ATPase or nonspecific phosphatase activities. This increase in high-affinity (Ca$^{2+}$ + Mg$^{2+}$)-ATPase activity may be part of the mechanism via which prolactin exerts its hypercalcemic action in freshwater fish.