Observations during the Coastal Transition Zone (CTZ) experiment in summer, 1988 reveal the presence of deep phytoplankton layers in a coastal upwelling system. The layers occur throughout the CTZ study area, including a strong baroclinic jet which was present over the period of the experiment. Based on a variety of bio-optical, hydrographic, and geochemical indicators, it is concluded that the water masses associated with the layers result from subduction processes. Criteria are developed to identify subducted water masses based on the beam attenuation coefficient, chlorophyll fluorescence, and distribution of light in the water column. Temperature-salinity characteristics are consistent with two source regions for the subducted layers, one near shore and a second farther offshore. Most of the layers correspond to the inshore source which is apparently distributed alongshore. Subducted water masses are found in all 5 grid surveys of the CTZ experiment and probably result from a variety of physical processes. One of these is flow along sloping isopycnal surfaces due to advection and mixing processes. Advection timescales for flow out the axis of jet range from a few days to a few weeks, depending on the depth of a particular surface, and the subduction indicators persist over these time scales.