The Pacific is the largest ocean in the world and therefore has a significant influence on climate and the functioning of the Earth system. As the terminus of the oceanic "conveyor-belt" circulation system, the North Pacific Ocean contains some of the world's oldest water. This report examines what is "known" about marine life, identifies the critical "unknowns" of marine life, and considers what might be fundamentally "unknowable" about marine life in the North Pacific Ocean. The report was a collaborative effort of the Census of Marine Life (CoML) and the North Pacific Marine Science Organization (PICES). It focuses on "core census" information such as taxonomy, distribution, and abundance, and on "function-related" information such as life histories, productivity, and spatial and temporal variability for several key groups of organisms: bacterioplankton, phytoplankton, zooplankton, unexploited fishes and invertebrates, exploited fishes and invertebrates, seabirds, and marine mammals.

summary

In general, "core census" information is adequate for larger-sized organisms. However, new species have been discovered recently, even among the marine mammals. These discoveries are likely to continue as new methods involving genetics become more widely applied in taxonomy. Three species (Steller's sea cow, Pallas' cormorant, and the Japanese sea lion) are known to have gone extinct within the last 300 years. Their larger size makes their absence more obvious. We have no idea about the smaller, more cryptic forms that may have gone extinct over the past few hundred years. Information on the distribution and abundance of fishes, seabirds, and marine mammals is largely adequate, although non-commercial fishes and invertebrates are not so well known as commercially important species. The Yellow Sea and the Sea of Okhotsk appear to have the highest numbers of "unique" finfish species (*i.e.*, species which do not occur in any other marine ecosystem in the North Pacific Ocean). Distributions and abundances of very small organisms such as bacterioplankton are mostly unknown. "Function-related' characteristics such as life histories, productivity, and seasonal, interannual and spatial variability are more poorly known than "core census" characteristics for all groups. Function-related information for commercial fishes, seabirds, and marine mammal species is somewhat better known than that for other organisms, but large knowledge gaps remain.

Exciting new discoveries have occurred in the North Pacific Ocean and elsewhere in the past few decades, such as a new kingdom of bacterioplankton (the Archaea), deep chemosynthetic ecosystems which derive their energy from minerals and gases vented from the ocean's crust (hot-vent systems), and deep cold-water coral reefs.

There are at least two "fundamental" unknowables about marine life in the North Pacific Ocean: i) the identification of all species, and ii) the abundances of all species. These are likely to be unknowable because of the difficulties of sampling the vast and deep North Pacific Ocean, and because of major differences in regeneration times (life spans) between bacterioplankton (less than one day) and whales, long-lived rockfishes, and clams (which can be over 100 years). There are also at least two "applied" unknowables about North Pacific Ocean marine life: i) predicting which species is likely to dominate blooms of plankton, and ii) how individual species and therefore, the ecosystem as a whole will respond to changes in natural (*e.g.*, climate) and/or human (*e.g.*, fishing, contaminants) forcing. These are likely to be unknowable because of the complexity and redundancy within marine ecosystems, and our inability to adequately understand and predict how any single species will respond to such changes. Understanding the limits of our knowledge and acknowledging the high levels of uncertainty will provide a more realistic assessment of marine life in the North Pacific, and may reduce the occurrences of "surprises" (*i.e.*, events beyond our narrow expectations) - surprises which seem, all too frequently, to be unpleasant.