Numerous studies have focused on arsenic in marine organisms, and relatively high natural levels of the element have been reported in marine samples. Despite their seemingly consistent presence in marine oils and fats, there is currently only limited knowledge available on arsenic compounds that exhibit lipid soluble characteristics, the arsenolipids, in contrast to the water-soluble arsenic species. The development of analytical techniques has, however, renewed the interest in these arsenic species and significant novel findings have been published in the last couple of years. The aim of this review is to present current knowledge on the occurrence and chemistry of arsenolipids in marine oils, and to identify future research needs. The occurrence of arsenolipids and their relevance in marine organisms will be discussed, in addition to their relevance for consumers and industry, with respect to feed and food safety and legislative issues. Analytical techniques, including techniques in the early work on arsenolipids in addition to methods employed today, and relevant sample preparation will be discussed.