

Appendix Seven

MARINE SCIENCE AND TECHNOLOGY INDUSTRY IN MASSACHUSETTS

EXISTING LITERATURE

Most of the literature that refers to the marine technology industry in Massachusetts is a bit outdated or focuses on partial components of the industry (Broadus, Hoagland, and Kite-Powell, 1988; Hoagland and Kite-Powell, 1991; Hoagland and Kite-Powell, 1993). These earlier studies all note the presence of a substantial marine sector in the New England region and help to trace a movement from a largely defense-based industry to one that also focuses on environmental monitoring and the development of cutting edge equipment for a variety of different sectors.

In 1991, 70% of the world marine market was estimated to be defense related (Hoagland and Kite-Powell, 1991). At that time, the U.S. market in marine electronic instrumentation was in the \$3-\$5 billion range, over 70% of which was defense related. In contrast, among the respondents to our survey of New England marine science and technology firms, only 40% indicated their products were defense related, while 38% were involved in ocean environmental monitoring and 36% were manufacturing marine science equipment destined for a variety of uses (the responses were non-exclusive and thus exceed 100%).

Another theme of some of these earlier studies is the much stronger role of European government involvement in spurring on the marine electronic instrument industry through substantial subsidies of research and development during the late 1980s (Hoagland and Kite-Powell, 1993). However, there does not seem to have been any recent studies of the impact of these government subsidies on the European industry. Regardless of these subsidies, our interviews revealed that many New England firms have a significant presence internationally, with some being among the top producers in the world of their particular products

There are two more recent studies that have a stronger focus on the Massachusetts marine technology sector. (Willauer, et. al., 1995) focuses on the Massachusetts marine sector, including seafood production and distribution, tourism, recreation, recreational boatbuilding, and transportation, in addition to higher technology marine sectors. Thus,

the focus of (Willauer, et al., 1995) is much broader than this report, which focuses specifically on marine technology. In addition, the numerical data on the relative sizes of different components of the marine sector found in (Willauer, et al., 1995) are much more aggregate than provided in this study and often rely on a number of key assumptions applied to large national studies to identify the Massachusetts component of most of the marine industries. (Willauer, et al., 1995) conclude that the Massachusetts marine industry employs 70,000 people and generates around \$4 billion in annual revenues, with marine instrumentation and boat building each accounting for 6% of this total, and marine research and education generating 5%. Marine environmental services are estimated to account for the second largest portion (25%) of revenues in this sector.

The most recent study (Georgianna, 2000) also focuses on the Massachusetts Marine Economy in general, but separates out marine technology and education, which includes marine instrumentation, environmental services, research and education. After noting the difficulties (which we expand on below) in identifying these sectors within traditional quantitative databases, it is estimated that marine technology and education employed 9,240 people in 1997 and generated \$420 million in revenues within Massachusetts. The marine instrumentation sector accounted for 57% of the revenues and half of the employment, with research being the second largest revenue generator and third largest employer, while environmental services was the third largest revenue generator and second largest employer. Because the sources of these numbers are not documented precisely in the study, it is hard to determine how they were derived.

As noted in many of these studies, and most recently in (Georgianna, 2000), the marine technology and education sectors in Massachusetts form a significant cluster of firms and educational institutions. Massachusetts is considered to be a world leader in many of these sectors, with the presence of marine research and educational institutions such as Woods Hole Oceanographic Institution, and the presence of substantial programs at the University of Massachusetts, MIT, and Boston University, as well as many of the other higher education institutions in the state. The importance of the marine instrumentation sector and the growing environmental services sector has been documented in several of these studies as well as others (see Diener, Terkla, and Cooke, 2000 for a detailed description of the Massachusetts environmental services industry).

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