1. Introduction

The northern Bering Sea amphipod community in the Chirikov Basin is composed primarily of tube-dwelling amphipods of the family Ampeliscidae (Stoker, 1981; Grebmeier et al., 1989; Highsmith and Coyle, 1991, 1992). Measurements in the 1980s indicated that the Chirikov Basin ampeliscids comprised one of the most productive amphipod communities on record (Highsmith and Coyle, 1990), with maximum values on the order of 170–230 kcal m^{-2} yr^{-1} and a mean dry weight biomass of 30–40 g m^{-2}. The Chirikov Basin amphipod bed was a focus of research in the 1980s, because the region was a major foraging ground of the Eastern North Pacific (ENP) population of the gray whale *Eschrichtius robustus* (Kim and Oliver, 1989; Moore, 2000; Moore et al., 2003), and dietary analysis indicated that ampeliscids were the primary prey item (Bogoslovskaya et al., 1981; Nerini, 1984). Historically, about 87% of the ENP gray whale population spent some time foraging in this area while in transit, and about 17% spent approximately 6 months of the year (May–October) in the Chirikov Basin to obtain most of their annual energetic requirements (Berzin, 1984; Thomas and Martin, 1986).

Although the gray whale population had been growing at a rate of 3.29% yr^{-1} since 1980 (Perryman et al., 1998; Rugh et al., 1999), a more than threefold increase in gray whale mortality occurred in the late 1990s and a decline in calf production of about 80% was observed (Le Boeuf et al., 2000; Moore et al., 2001). Abundance estimates have fallen from 29,758 whales in 1997/1998 to 18,178 ($\pm$10% coefficient of variation) in 2001/2002 (Rugh et al., 2005), a decline of about 30%. The reasons for the gray whale population declines are uncertain; however, food limitation is one potential cause. Recent evidence indicates that gray whales may be approaching the carrying capacity of their habitat (Moore et al., 2001; Rugh et al., 2005) and the gray whale population may have been high enough to impose top-down control on the amphipod community in the Chirikov Basin as early as the 1980s (Highsmith and Coyle, 1992). In addition, climate-related changes in the Bering Sea ecosystem (Napp and Hunt, 2001; Hunt and Stabeno, 2002; Schumacher et al., 2003) suggest that gray whale food resources may be impacted by global climate change. To determine if gray whale food sources had declined in the Chirikov Basin, in 2002–2003 we resampled stations from the earlier amphipod study in the 1980s, to permit comparisons of amphipod abundance, biomass, and productive capacity in the two periods. Here we present the most recent estimates of ampeliscid abundance and biomass in the Chirikov Basin, and compare the results with those of earlier studies.

1.1. Site description

The Chirikov Basin covers about 40,000 km^2 in the northern Bering Sea between St. Lawrence Island and the Bering Strait (Fig. 1). The bottom is flat and sandy (Grebmeier et al., 1989) with an average bottom depth of about 40 m. Low ^{210}Pb-ex concentrations (9.3–16.7 mBq g^{-1}) suggest a very low sedimentation rate (Grebmeier, 1993). The region is characterized by three major water masses, the Alaska Coastal Water (ACW), the Anadyr Water (AW), and the Bering Self Water (BSW). The Chirikov Basin, where the amphipod bed occurs (Fig. 1), is occupied by AW and BSW water masses (Coachman et al., 1975). The AW originates at the Bering Sea shelf break and is the source of nutrients driving the high primary production over the amphipod bed (Walsh et al., 1989). Because ampeliscids are sedentary tube dwellers that feed primarily on phyto-detritus (Highsmith and Coyle, 1991), they require a high flux of phytoplankton to the bottom to maintain their dense populations and high productivity.

2. Methods

2.1. Amphipod sampling

Baseline data to assess changes in amphipod populations were collected between late May and early November 1986–1988 (Table 1), as reported in earlier publications (Highsmith and Coyle, 1990, 1991, 1992). During 2002 and 2003, two cruises were made to the study site between late June and the end of September of each year. Twenty stations were sampled in the Chirikov Basin between 63°N and 65°N and 168°W and 170°W (Fig. 1(B), black dots). Sampling locations and methodology were identical to those in the earlier study. Five replicate benthic samples were taken at each station with a 0.1 m^2 van Veen grab. The samples were sieved through a 1-mm screen and all animals retained on the screen were preserved in 10% buffered formalin for later sorting and analysis.