ABSTRACT

In 2008, we began a multi-year, interdisciplinary ecological study (CSESP) in the vicinity of proposed exploration and oil and gas prospects in the northeastern Chukchi Sea. This study, which was supported by ConocoPhillips, Shell Exploration and Production Company, and Statoil, was designed to collect information on the ecosystem prior to exploration to fill data gaps in the area and to provide baseline environmental data that can be used for permit applications and as baseline data for post-development comparisons. We also deployed oceanographic and acoustic moorings before and after these three cruises, during the open-water period, and deployed some over the winter. We describe the study background and study design to provide an overview for the various presentations on the study.

BACKGROUND

There is great interest in offshore oil and gas development in the northeastern Chukchi Sea, off of northwestern Alaska. Because of the interest, there is a need for recent information on the oceanography and ecology of the region, both new information and information needed to update historical data sets. This information can help to provide a better understanding on the ecology of the area and to provide perspective on long-term environmental change that may have happened in the area.

To help provide this information, we began in 2008 the Chukchi Sea Environmental Studies Program (CSESP), an integrated interdisciplinary, ecosystem-level approach to studying the environment in this area. This program recently completed its third year of studies (2009–2010).

OBJECTIVES

The objectives of this program are:

1. To provide data for pre-exploration and development-related activities;
2. To provide data for research and applications and as baseline data for post-development comparisons;
3. To provide input to planning of future operator and associated mitigation; and
4. To promote additional science, and improve our understanding of the potential environmental effects of offshore oil and gas exploration and development in the northeastern Chukchi Sea.

STUDY AREAS

In 2009 and 2010, we sampled two study-area boxes in the northeastern Chukchi Sea known as Klondike and Burger (Figure 1). Each study area box is 30x30 NM in size and contains within it a smaller box that represents the area of greatest interest for oil exploration. Klondike lies in oceanic water on the edge of the Central Channel Current, whereas Burger lies in more shelf-like on the southern slope of Hanna Shoals, however, oceanographic and acoustic environments sometimes cover this area. Both study areas lie in waters ~40 m (~200 m) deep. Burger is a smaller box that represents the area of greatest interest for oil exploration and development in the northeastern Chukchi Sea.

DATA COLLECTION

In each year, we collected data during each of three cruises that sampled both study areas; we also deployed acoustic and oceanographic moorings within the study area and at sea. During the oceanographic cruises, we sampled a suite of environmental characteristics on each cruise and sampled others on only one or two cruises (Table 1). Characteristics sampled on one cruise were those that change rapidly over time, such as physical oceanography (CTD casts), zooplankton (both vertical tows and diagonal bongo tows), and benthic epifauna (begun in 2009), whereas shelf-type water generally lies over Burger most of the time. In some years, however, the flow of oceanic water is so strong that it floods both study areas, such as was seen in 2008 (Figure 4).

ACOUSTIC AND OCEANOGRAPHIC MOORINGS

We conducted active acoustic sampling of marine mammals and measured ambient noise in the environment in and around both study areas (Figure 3). These passive and active acoustics were conducted within the areas of greatest interest for oil exploration and monitoring that sampled the overwinter environment (Figure 2). These oceanographic moorings were used upward-looking ADCP to quantify movements of water in various layers in the water-column (Figure 3). In addition, we conducted passive oceanographic sampling of the water-column with oceanographic moorings that sampled the overwinter environment (Figure 2). These oceanographic moorings were used upward-looking ADCP to quantify movements of water in various layers in the water-column.

PRELIMINARY RESULTS

Although we do not yet have all three years of data and samples analyzed, we believe that the oceanography and ecology of the two study areas differ greatly. We believe that the boundary between the two water masses generally lies between the two study areas boxes, separating the area into different environments—an oceanic pelagic system and a shelf-type benthic system.

PHYSICAL OCEANOGRAPHY

Oceanic water generally flows from Klondike and to the west, southwest, and south of Burger whereas shelf-type water generally lies over Burger most of the time. In some years, however, the flow of oceanic water is so strong that it floods both study areas, such as was seen in 2008 (Figure 4).

ZOOPLANKTON

In general, zooplankton communities differ between the two study areas, although there is obvious leakage of organisms between the two areas. Most oceanic zooplankton occur in Klondike, whereas the Burger area is dominated more by shelf-type species.

BENTHIC INFUANA

Benthic communities differ greatly between the two study areas in both abundance and biomass. The same species occur in the same area, but abundance in Burger is 4 times that in Klondike and biomass in Burger is 2 times that in Klondike (Figure 5).

SEABIRDS

Seabirds have the same species in the two study areas, but abundance differs between the two areas, and the birds’ high mobility allows them to take advantage of interannual variation in oceanography. For example, Crooked Auks, which feed on larger oceanic zooplankton, occurred primarily in Klondike in 2008, whereas they spread over both study areas as oceanic water flooded them in 2009 (Figure 4).

MARINE MAMMALS

Marine mammals respond both to the oceanography of the area and to indirect effects such as sea ice, which is affected by the oceanography of the area. Similar to what was seen for the benthic data, benthic-feeding marine mammals such as Walruses and Bearded Seals are more common in Klondike whereas most marine mammals such as Harp, Bearded, and Ringed Seals are more common in Burger. The only marine mammal that is more common in Burger than in Klondike most years but may be equally common in both areas is the Bearded Seal, which increased in abundance in years in which oceanic water flooded the entire study area (Figure 7).

2010 AND BEYOND

Although this poster describes activities in 2008–2010, the study continued and expanded in 2010. Efforts expanded in 2010 and the future includes:

- Continued sampling in Klondike and Burger in 2010.
- The 2010 addition of a herbarium study area (Barley, which lies off the northeastern corner of the Burger study area).
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- ConocoPhillips (COP) Exploration Plan to be submitted in June 2011.
- SEPCC exploration drilling to occur in 2012.
- COP exploration drilling to occur in 2013 at the earliest.
- Continued collaboration with local co-management groups on scientific studies (e.g., tagging of Beluga, Walruses, and ice seals) and Traditional Ecological Knowledge (e.g., TDK study of Piler Bay) and personal communication.
- Production of annual and synthesis reports.
- Production of scientific publications, both by discipline and as a synthesis of the ecology of the area.

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