In the western North Atlantic, humpback whales (*Megaptera novaeangliae*) migrate from summer feeding grounds off the coasts of the northeastern U.S., Canada, Greenland, and Iceland to winter breeding grounds in the Greater and Lesser Antilles (Leatherwood *et al.* 1976, Katona *et al.* 1983, Martin *et al.* 1984, NMFS 1991). The end points of the breeding migration are well documented (Katona 1986, Mattila *et al.* 1989, Katona and Beard 1990); however, exact routes are not known. It is believed that these humpback whales migrate well offshore in deep ocean waters (Winn and Reichley 1985, Stone *et al.* 1987, Clapham and Mattila 1990, NMFS 1991). It has also been suggested that during the breeding migration and residency on the breeding grounds, humpback whales engage in little, if any, feeding activity (Dawbin 1966, Baraff *et al.* 1991).

Previous research has indicated that the geographic and temporal distribution of juveniles (sexually immature) in the western North Atlantic is similar to that of other humpback whales (Goodale 1982, NMFS 1991). Most adult and newborn North Atlantic humpback whales are on breeding grounds between January and April; however, there are reported sightings in high latitude waters in these months (Williamson 1961, Katona 1986, Whitehead 1987). Little information, though, exists on the activities of juveniles during this time. Known juveniles have been reported on the outskirts of primarily adult “surface active groups” in breeding areas (Mattila *et al.* 1989). Segregation by age and reproductive class has been reported for migrating humpback whales in other geographically distinct areas (Nishiwaki 1959, Dawbin 1966). This segregation has not previously been documented for North Atlantic humpback whales during winter migrations (NMFS 1991).

We offer the first report of humpback whales in nearshore waters off the coast of Virginia during the months of January through March 1991 and 1992. We observed juvenile humpback whales feeding near the mouth of Chesapeake Bay, within 4 km of shore. The appearance of the whales was correlated with large aggregations of feeding birds and the presence of large schools of fishes. Our observations support the hypothesis that some juvenile humpback whales do not migrate to breeding grounds but, instead, migrate to mid-Atlantic nearshore waters apparently to feed.
Since 1989 the stranding program of the Virginia Marine Science Museum (VMSM) has been recording strandings and sightings of marine mammals. In the winters of 1991 and 1992, dramatic increases in sightings of large cetaceans were recorded. For the purpose of this paper, the term “sighting” is defined as a short-term observation used mainly for confirming the presence, but not always the species, of large cetaceans. Sightings were reported by the general public, VMSM staff, and other agencies. Various methods were used for data collection including shore-based sightings and shipboard observations. Most sighting data were opportunistic. In addition, one aerial survey was undertaken during each year of the study utilizing rotary wing aircraft.

Beginning in January 1992, VMSM initiated more directed efforts to observe the whales. A “behavioral/identification” (BID) observation is defined as a long-term (more than 10 min), close-up observation where species, behaviors, and identities were documented. BID observations were conducted during a period which began on 18 January 1992 and continued through 20 March 1992. The study area (Fig. 1) was a strip of coastal ocean 4 km wide and 20 km long in Virginia Beach, Virginia, extending south from the mouth of Chesapeake Bay (36°49′45″N to 36°58′45″N). BID data were collected using 35-mm photography, video recordings, and behavioral records. Photographs of dorsal fins, flukes, and scars were cataloged for individual identification. Shipboard observations were conducted from an 8.5-m and 9.75-m Albemarle, a 3-m Zodiac, and four whale watch vessels ranging from 19 to 23 m in length. During all observations the whale watch guidelines suggested by Beach and Weinrich (1989) were followed.

While large cetaceans are sporadically sighted throughout the year in Virginia, a sharp increase in the numbers of nearshore (defined here as within 4 km) sightings was reported from January through March 1991. All sightings verified by VMSM staff were found to be humpback whales. Sightings were made primarily from shore because the whales were usually no more than 500 m from the beach. Although the total number of individuals observed in the winter of 1991 cannot be determined, 61 large cetacean sightings were recorded between January and March. In fall of 1991, 8 sightings were reported from October through December. In January 1992, 19 sightings were reported. In response to these sightings, we initiated BID observations.

During the BID period (18 January through 20 March 1992), 12 individual humpback whales were photographically identified. Identities were established by fluke and dorsal fin photographs (Katona and Whitehead 1981). Since the whales did not often dive steeply in the shallow water of the study area, standard fluke photographs were rarely obtained. Identification of individuals frequently relied on dorsal fin and dorsolateral features. Some whales were recorded as “unidentified” because of a lack of distinctive dorsal markings and/or other photographic evidence to distinguish them as individuals. Resights of known individuals were used to estimate potential residency within the study area during the BID period. For this study, residency is defined as the time interval between the first and last observations within the study area. Three identified individuals were observed only once. The longest resident in the study area was “Tateertail”
Figure 1. Geographic study area (shaded) for "behavioral/identification" (BID) observations from January to March 1992. Arrow in inset of mid-Atlantic states points to the region of coast enlarged at right of figure. VA = Virginia, NC = North Carolina, CB = Chesapeake Bay, VB = Virginia Beach area. Scale bar = 10 km.

(VMSM Mn 92001), first photographed on 30 January and last observed on 1 March. Other individuals were observed over 2–14 d periods with an average residence of 6.33 d for the 12 identified animals (Table 1). One individual known as "Bulls Eye" (VMSM Mn 92010) was videotaped feeding within the study area on 25 January and 44 d later at the Chesapeake Bay Bridge (38°59'45"N/76°23'45"W), a distance of over 200 km NW into Chesapeake Bay.

During the BID period body lengths of individual humpback whales were estimated by observers using nearby vessels for reference. All of the whales observed within the study area were judged to be 11 m or less in total length. Length at weaning for humpback whales is estimated at 8.0 m and length at sexual maturity at 11.6 m and 12.0 m for males and females respectively (Nishiwaki 1959, Rice 1963). The known winter distribution of adult whales on the low latitude breeding grounds combined with the size estimates of whales within the study area suggest that these individuals are sexually immature juveniles.

Throughout the BID period, individual humpback whales exhibited behaviors
consistent with feeding as previously described (Han et al. 1982). Feeding behaviors were observed in water depths of 2.5–16 m. Three known individuals were observed filter feeding at the surface, and two were seen subsurface filtering following a single, forceful slap of the flukes on the surface. When feeding in very shallow water (2.5–6 m), humpback whales were observed lunging, rolling, and creating sediment plumes and heavy surface turbulence. Defecation was observed on two occasions and recorded on videotape. One known individual was seen at the surface with sediment pouring from its mouth. Two known individuals had freshly abraded areas on the right side of the rostrum and mandible and on the tips of the flukes. These observations and behaviors suggest that these animals were feeding on or near the bottom.

From the beginning of the BID period until approximately 1 March, the humpback whales were seen in conjunction with large aggregations of feeding birds, primarily northern gannets (Morus bassanus). Other bird species observed were brown pelicans (Pelecans occidentalis), double-crested cormorants (Phalacrocorax auritis), and several species of gulls and terns. Whales were often spotted on the outskirts of groups of actively feeding birds. Fish finders on the whale watch vessels indicated large schools of fish which were often thick enough to give false bottom readings. On 16 February an otter trawl was pulled for five minutes in 4.5 m of water in an area of observed whale feeding behavior. The haul consisted primarily of 4–8 cm bay anchovies (Anchoa mitchilli). Gillnet operations conducted within the study area reported catching striped bass (Morone saxatilis) with menhaden (Brevoortia tyrannus) in their stomachs. The gannets and the large schools of fishes decreased after the first of March. Although the BID period extended until 20 March, the last whales were observed on 4 March, and the last reported sighting in the period was 11 March. Following the BID period, sporadic sightings continued to be reported in and around the study area.

Aerial surveys in 1991 and 1992 provided more information on the numbers and distribution of whales in the Virginia study area and along the coast farther south into North Carolina. On 8 February 1991, six humpback whales and two fin whales (Balaenoptera physalus) were sighted in the study area off Virginia Beach. On 28 February 1992 a coastal survey was conducted from Virginia Beach (36°55'00"N) to Nags Head, North Carolina (35°56'30"N). In this survey three humpbacks were sighted in the Virginia Beach study area, and six humpbacks and two fin whales were sighted off Nags Head.

Our study presents new information on the winter distribution of North Atlantic humpback whales. Small, presumably sexually immature whales are present and feeding in nearshore waters of Virginia during the winter. In addition, evidence suggests that this phenomenon may be occurring in other mid-Atlantic states. Humpback whale stranding data from Virginia and North Carolina support our size estimates of less than 11 m total length. Of the fifteen humpback whales stranded in Virginia and North Carolina from January 1990 to March 1992, fourteen measured less than 11 m, and one was not measured (Wiley et al., in prep.).

The appearance of increasing numbers of juvenile humpback whales in Vir-
Table 1. Residency of humpback whales in the “behavioral/identification” (BID) study area from January to March 1992. All data reported in this table are BID observations. “Bulls Eye” was sighted within the Chesapeake Bay 44 d after its initial observation in the BID study area. The average residency period was 6.33 d. “Whale name” refers to VMSM provisional names used in the Virginia Humpback Catalog.

<table>
<thead>
<tr>
<th>Whale ID#</th>
<th>Whale name</th>
<th>No. of observations</th>
<th>Residency (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mn 92001</td>
<td>Tattertail</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>Mn 92002</td>
<td>Rabbit</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mn 92003</td>
<td>Two Nicks</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Mn 92004</td>
<td>Faced</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Mn 92005</td>
<td>Lumpy</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Mn 92006</td>
<td>Rugrash</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Mn 92007</td>
<td>No Fin</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Mn 92008</td>
<td>Hook</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mn 92009</td>
<td>Flukes Too</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mn 92010</td>
<td>Bulls Eye</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mn 92011</td>
<td>Mort</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mn 92012</td>
<td>White Tip</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Virginia coastal waters has been quite dramatic. Anecdotal evidence supports the hypothesis that this phenomenon is recent. Commercial and recreational fishermen as well as long-term coastal residents confirm our belief that the seasonal abundance of humpback whales in Virginia has greatly increased. Stranding records from 1985 to 1992 for humpback whales in the mid-Atlantic region show corresponding increases in stranding frequencies in recent years (Wiley et al., in prep.).

Unfortunately, the apparently expanding presence of these whales in mid-Atlantic coastal habitats increases the potential for adverse interactions with commercial and recreational vessels and/or fishing gear. In Virginia, juvenile humpback whales are found in and around some of the busiest military and commercial shipping lanes in the U.S. and are present during a winter/spring gillnet fishery. Our stranding records include two confirmed vessel strikes and two entanglements since 1990.

This study offers the first report of juvenile humpback whales feeding in the nearshore waters of Virginia. Spatial and temporal use of this winter habitat by juveniles presents significant new information which should be considered in the recovery plan for this species (NMFS 1991). Our study suggests that age/reproductive class segregation during migration and wintering of North Atlantic humpback whales is occurring. The frequency of observations of identified individuals during the BID period suggests that these whales were indeed resident throughout the study period. Although no individual was observed long enough to preclude the possibility that it migrated to the Antilles, our data are consistent with the hypothesis that juvenile humpback whales seen nearshore along the mid-Atlantic coast during the winter do not visit the breeding grounds that year. In addition, observed feeding behaviors in areas of concentrated sources of food indicate that winter foraging may cause this distribution.
The presence of juveniles in Virginia broadens currently accepted theories of winter distribution. Juvenile humpback whales in Virginia waters may be a natural result of an expanding North Atlantic population (Katona and Beard 1990). Efforts are currently underway to compare Virginia’s catalog of known individuals with existing catalogs to determine exact ages and feeding stock(s) for these humpback whales. This information may provide further evidence for identifying alternate winter migration destinations for some North Atlantic juvenile humpbacks. Further study is needed to fully document the extent to which juvenile humpbacks are utilizing nearshore waters of U.S. mid-Atlantic states. The results may prove to be vital new information for the continued recovery of this endangered species.

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