

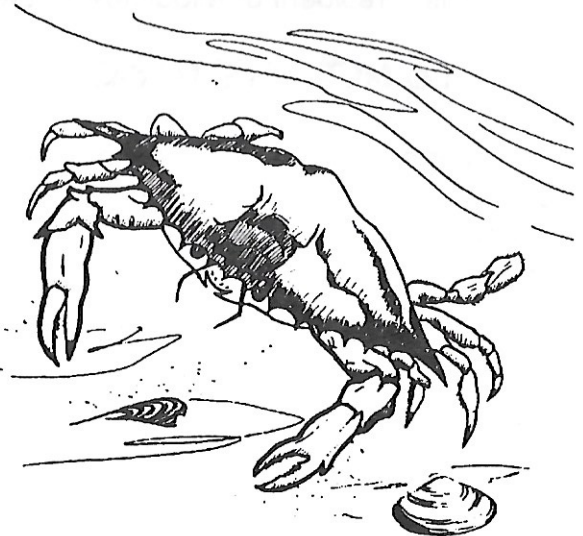
## INTRODUCTION

The Raritan Bay estuary includes a southern shoreline which is 20 miles long located between South Amboy to the west and Atlantic Highlands to the east. Middletown Township has 4.5 miles of bayshore frontage, including 1.5 miles of the last remaining dunes of the Raritan Bay's southern shoreline. The Middletown shore is divided by three tidal creeks: Pews, Comptons, and Ware. Each creek in its backbeach area has associated salt water wetlands which encompass approximately 460 acres within Middletown.

Throughout the historical development of Monmouth County's bayshore region, the shorefront and wetlands were the last areas of development, mainly because shifting shorelines and damaging coastal storms inundated these areas. However, the shorefront and wetlands could not escape the pressures of growth and development, and most of these areas along the bayshore eventually disappeared. Since the 1970's federal and state regulations have been passed which govern the planning and review process for development within the shorefront and wetland environments. These regulations have helped preserve the remaining coastal ecosystems along the Jersey shore, including the bayshore region.

## GEOLOGICALLY: WHERE ARE WE?

The Raritan Bay estuary began to develop during the end of the continental glaciers approximately one million years ago during the Pleistocene Ice Age. At the height of the Ice Age the glaciers made their farthest advance south to the present locations of Perth Amboy, New Jersey, and Staten Island and Long Island, New York. The glacier was a source of sand and gravel debris eroded from exposed bedrock to the north. At its farthest southward advance the glaciers deposited hills of sand to rock-size debris called a termi-



Blue Crab

nal moraine. Meltwater streams flowing off the front of the glacial ice sheet removed the sand and gravel and deposited the material over the surface of what would become the bayshore region.

The Ice Age was global, locking vast quantities of water within the continental ice sheets and causing a reduction in size of the Earth's oceans. The size reduction caused the oceans to retreat from their current shorelines to a lower elevation which corresponded with the continental shelves. The Atlantic Ocean during the Ice Age had its shoreline 100 miles east of New Jersey at the continental shelf margin. At that time streams and rivers fed by glacial meltwaters and precipitation flowed across the exposed continental shelf and discharged



Bayberry at Pews Creek

into the Atlantic Ocean at the shelf margin. The erosive force of those streams can be seen in the submarine canyons such as the Hudson Canyon and Toms Canyon along the continental shelf margins off the present New Jersey coast.

Approximately 20,000 years ago the continental ice sheet began to retreat northward from the terminal moraine. Coinciding with the ice retreat and release of water from the glaciers was the rise in sea level. The inundation of the continental shelf covered its landforms, reworking the sediment into coastal features that advanced westward with the Atlantic Ocean's shoreline. Also inundated with sea level rise

were the ancestral Hudson and Raritan Rivers and their tributaries. These drowned stream valleys became the present Raritan Bay and Hudson River estuaries collectively known as New York Harbor. It was the post Ice Age sea level rise that had created the present natural landscapes of the bayshore region. The forces that had and still are shaping the bayshore will be reviewed in more detail for both the beach and tidal marsh ecosystems.