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Map Showing the Distribution of Surficial Sediments in Fishers Island Sound, New York, Connecticut, and Rhode Island

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Comments

U.S. Government document.

See also these related documents:

Organic Carbon, Hydrogen, and Nitrogen Concentrations in Surficial Sediments from Western Long Island Sound, Connecticut and New York

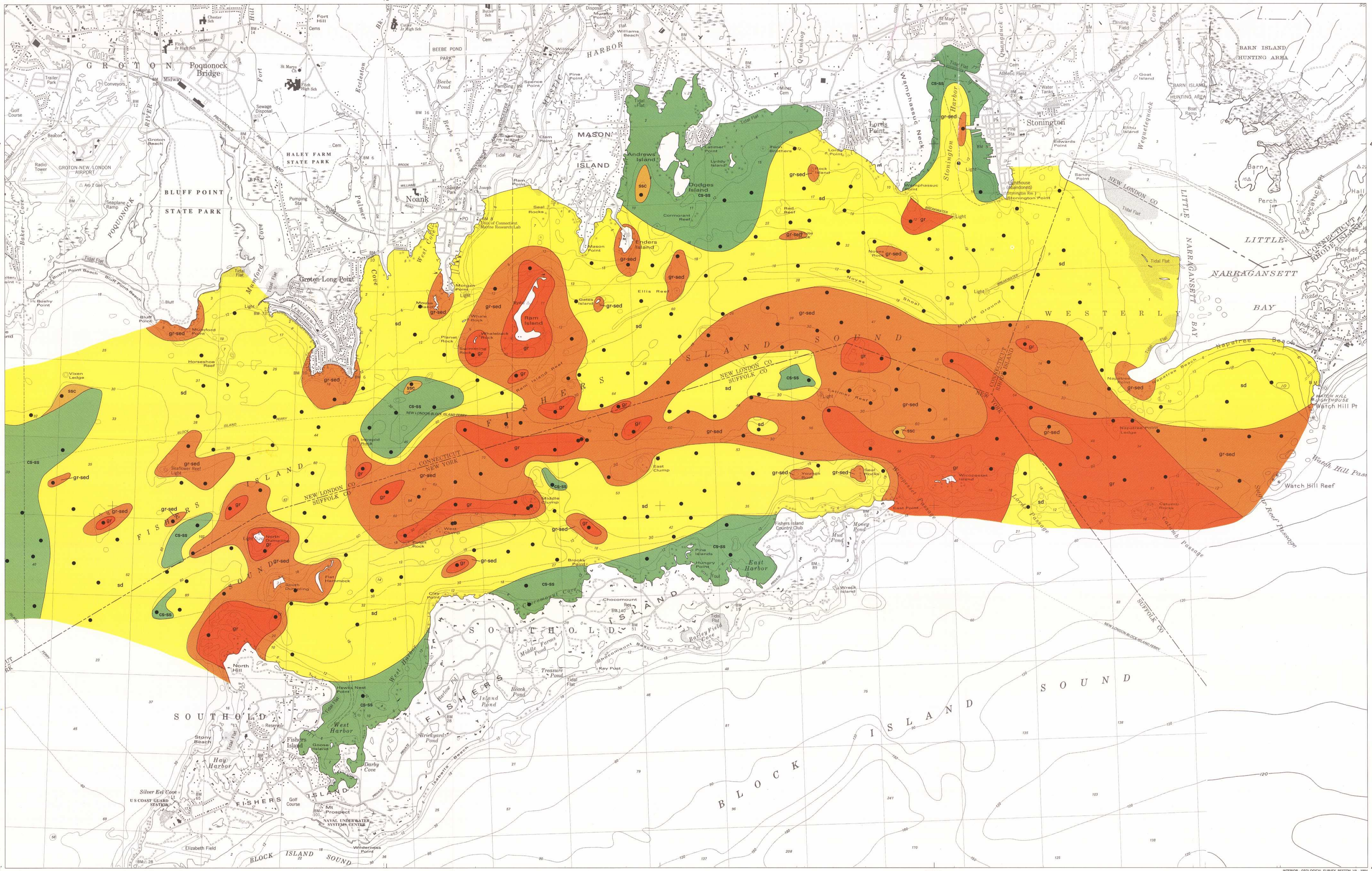
Sidescan Sonar Image, Surficial Geologic Interpretation, and Bathymetry of the Long Island Sound Sea Floor off Hammonasset Beach State Park, Connecticut

Sidescan Sonar Image, Surficial Geological Interpretation, and Bathymetry of the Long Island Sea Floor off Milford, CT

The Texture of Surficial Sediments in Central Long Island Sound off Milford, Connecticut

The Texture of Surficial Sediments in Western Long Island Sound off the Norwalk Islands, Connecticut

Prepared in cooperation with the
STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
GEOLOGICAL AND NATURAL HISTORY SURVEY



Base modified from U.S. Geological Survey
Mystic and New London, 1984;
Watch Hill, 1953 (photorevised 1984)

APPROXIMATE MEAN DECLINATION, 1994

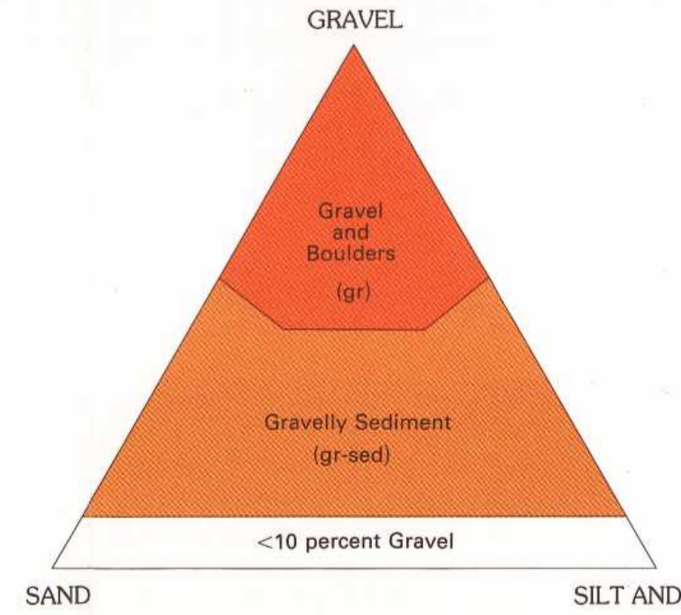
SCALE 1:24 000

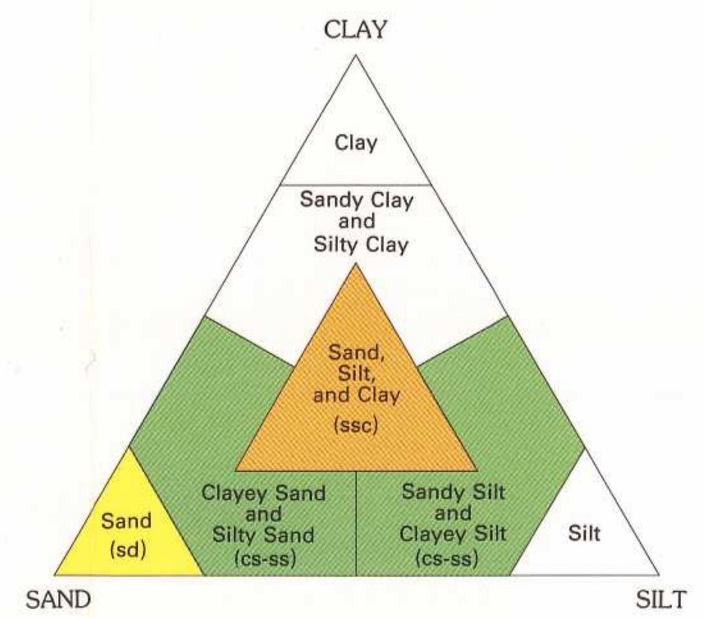
BATHYMETRY IN FEET

Manuscript approved for publication October 19, 1993

EXPLANATION

(Uncolored units are not represented on the map)





● Sample locality

DISCUSSION

INTRODUCTION

The data presented on this map were collected as part of a State of Connecticut and U.S. Geological Survey (USGS) cooperative program intended to further understand the marine geology of Connecticut and Long Island Sound. The purpose of this cooperative program is (1) to resolve sedimentologic and oceanographic problems and data gaps in Long Island Sound, (2) to integrate these findings with terrestrial data and the Pleistocene histories of Long Island and Connecticut, and (3) to initiate investigations of offshore resources that are keyed to the better management of Long Island Sound. With this in mind, the fundamental objectives of this study were to determine the distribution of surficial sediments in Fishers Island Sound and to describe the active sedimentary processes.

Sampling of surficial sediments was attempted at 255 locations during June, 1992 aboard the RV *Asterias* using a Van Veen grab sampler. The grab sampler was equipped with an Osprey Camera system attached to an 8 mm video cassette recorder. This video system was used to appraise the bottom variability at each station and observe boulder fields and bedrock outcrops where sediment samples could not be collected. Only the upper 2 cm of surficial sediment was sampled; these samples were frozen and stored for analysis. Navigation was performed using a differential Global Satellite Positioning (GPS) system and loran-C.

Standard textural methods were employed during this study (Schlee, 1966; Folk, 1974; Schideler, 1976; Poppe and others, 1985). The sediments were classified using the Wentworth (1929) grain-size scale and the Shepard (1954) scheme of sediment classification. Certain categories were combined because of the paucity of some sediment textures (see Explanation). Bathymetric contours are in feet; the bathymetry was used as a guide in placing some of the boundaries between different sediment types. Blank sections of the map indicate areas where data were insufficient to infer sediment type. These areas are generally limited to Block Island Sound, the area just west of Fishers Island, and small bays and coves along the Connecticut and Rhode Island coasts. The textural interpretations presented here are supplemented by data from earlier studies (Schlee, 1973; Akpati, 1974).

STUDY AREA

Fishers Island Sound, which lies between 71°51′W and 72°3′W, is about 13 km long and 4.6 km wide. The sound is bordered by Fishers Island, New York on the south, southeastern Connecticut on the north, and southwestern Rhode Island on the northeast. Fishers Island Sound opens into eastern Long Island Sound on the west and into Block Island Sound to the east. Water depths in Fishers Island Sound gradually increase toward the west where the maximum water depth exceeds 30 m.

Crystalline rocks of pre-Mesozoic age probably dominate the bedrock lithology of Fishers Island Sound (Needell and Lewis, 1984). The bedrock is unconformably overlain by glacial deposits composed mainly of glaciolacustrine silt and sand put down as deltaic fans and of glacial drift put down as a series of recessional end moraines (Lewis and Stone, 1991). The Harbor Hill- Roanoak Point-Fishers Island-Charlestown moraine belt, which is of late Wisconsinan age, lies across northern Long Island and makes up Fishers Island and Watch Hill, Rhode Island (see Index Map). Less prominent end moraines control much of the bathymetric relief in Fishers Island Sound.

The surficial bottom sediments of the sound are predominantly composed of materials reworked from these glacial deposits during the Holocene by strong tidal currents that range up to 2.0 knots. The irregular bottom topography, well-developed bedforms, and extensive lag deposits of boulders reflect this scour, transport, and reworking of the glacial and early post-glacial deposits (Lewis and Stone, 1991).

SEDIMENT DISTRIBUTION

Gravel and gravelly sediment (gr and gr-sed) dominate the surficial sediment texture in the central axis of Fishers Island Sound and on the submerged part of the Fishers Island-Charleston moraine belt where the tidal flow is constricted and the currents are the strongest. Gravelly sediments are also prevalent on bathymetric highs and in the shallow areas directly offshore from promontories where episodic storm currents combine with the tidal currents. Examination of the grab samples revealed that the gravel often occurs in thin surficial layers, which are underlain by finer grained sediments. This stratification is caused by strong tidal currents that erode the underlying glacial till and winnow away the finer grained materials. Subsequently, thin lag deposits of gravel remain to armor the underlying silt and sand. Sponges, rock crabs, lobsters, starfish, welks, and mussels are commonly observed in the bottom photography of the gravelly areas.

The grain-size distributions of the gravelly sediments tend to be poorly to very poorly sorted and bimodal. Three explanations are offered for these distributions. First, till, which by definition is poorly sorted, underlies and is exposed in the study area (Lewis and Stone, 1991). Second, the grab sampler penetrated the lag deposits described above, collecting both the gravel armor and the underlying silt and sand. Third, seaweed-encrusted coarse gravel was occasionally observed being "rafted" by currents across the study area during bottom photography. When the seaweed dies, the gravel is stranded in finer grained, hydraulically unequivalent sediments and the sediment becomes a gravelly sand.

Textural samples were not collected at 31 of the stations because the bottom photography revealed the presence of numerous boulders. The boulders, which would have prevented the collection of texturally representative samples, are often covered by kelp and other nondescript seaweed and variably inhabited by starfish, anemonies, and mussels. No bedrock outcrops were observed at any of the sample stations.

Sand (sd) dominates the areas adjacent to the central axis, in bays, behind breakwaters, and all across the westernmost part of Fishers Island Sound. Bedforms present on the sandy areas include current ripples, oscillation ripples, and, in some places near the gravelly central axis, sand waves. Sandy areas in 1 to 3 m of water are often overgrown by eel grass. Shell hash, hermit crabs, gastropods, skates, flounder, and burrows were observed in the bottom photography from these sandy areas.

The sand in the eastern part of the sound and adjacent to the gravelly areas tends to be moderately to moderately well sorted and to display a unimodal grain-size distribution. Sorting in the sand decreases both inshore toward the bays and coves and toward the western part of the sound.

Finer-grained muddy sediments (cs-ss and ssc) are restricted to enclosed bathymetric depressions, a small area about 1 km south-southwest of Noank, and in coves along the coast and along the north shore of Fishers Island. These muddy sediments are usually heavily burrowed by amphipods, polychaetes, and bivalves (quahogs and razor clams); spider crabs and blue crabs were commonly observed during the bottom photography.

The present distribution of surficial sediments in Fishers Island Sound is shaped from the deposits left by the last glaciation and reflects the cumulative effect of reworking, transport, and deposition by tidal and, to a lesser degree, by storm currents during and since the Holocene eustatic rise in sea level. The predominantly coarse-grained nature of the sediments and the abundance of bedforms reflects the constant winnowing and transport associated with strong tidal currents. The presence of finer grained sediments only in enclosed bathymetric depressions and coves suggest that more tranquil conditions, which can permit muddy sediments to accumulate, are present in these environments.

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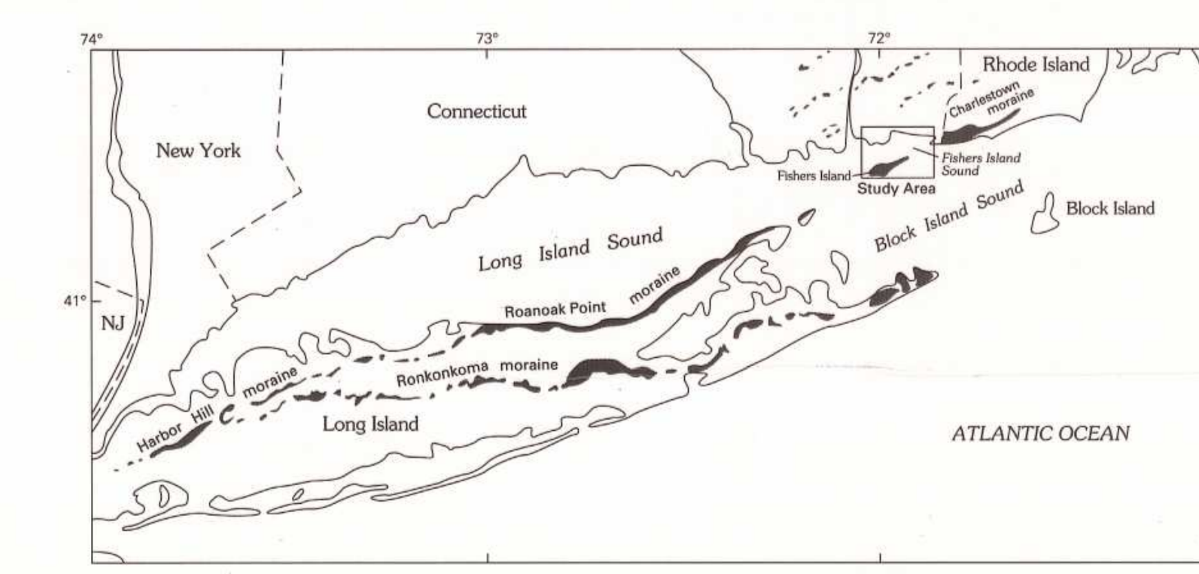

Index map

MAP SHOWING THE DISTRIBUTION OF SURFICIAL SEDIMENTS IN FISHERS ISLAND SOUND, NEW YORK, CONNECTICUT, AND RHODE ISLAND

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