

Sedimentary Analysis from the Mouth of the Great Bay Estuary

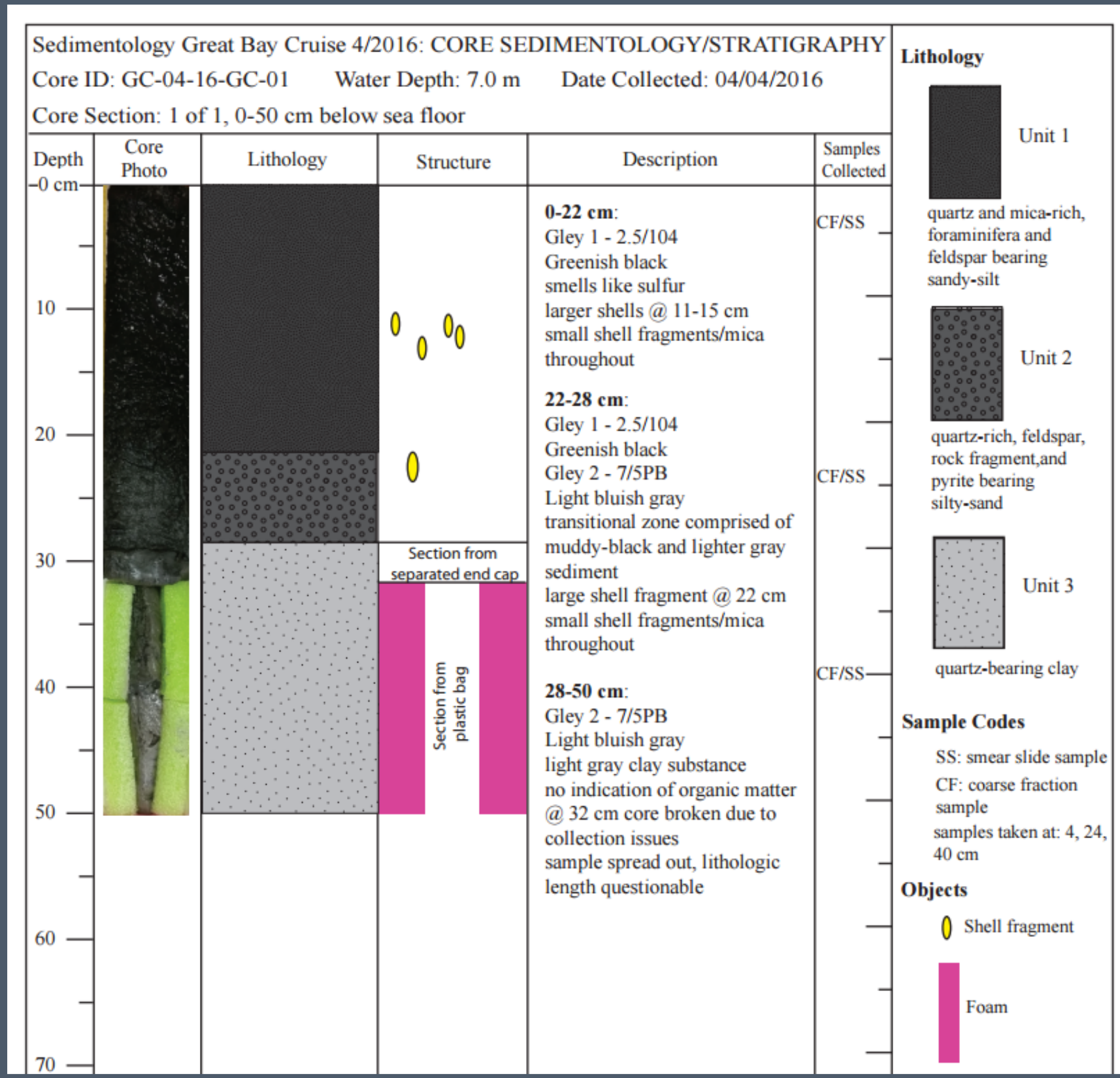
Lithologic Analysis



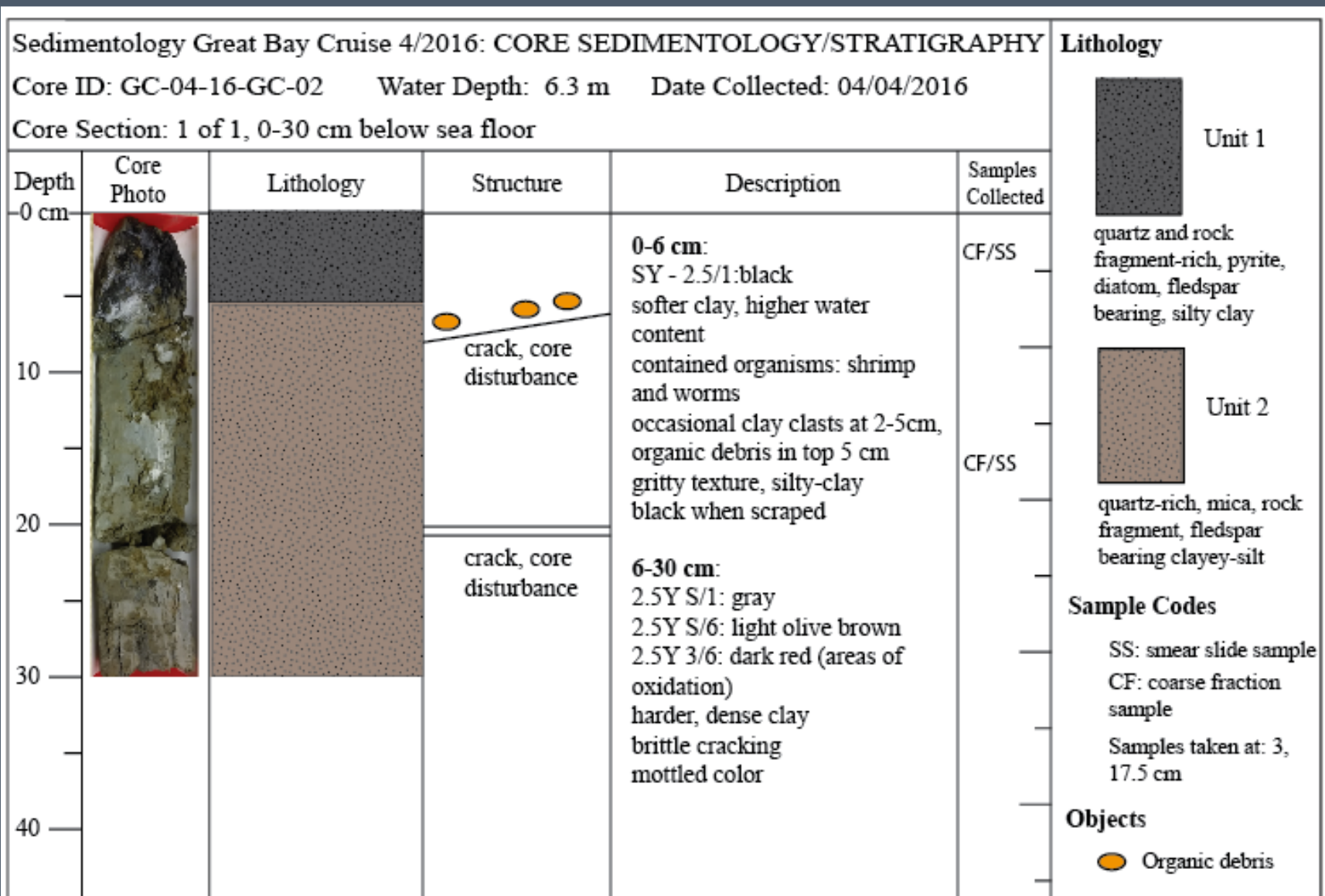
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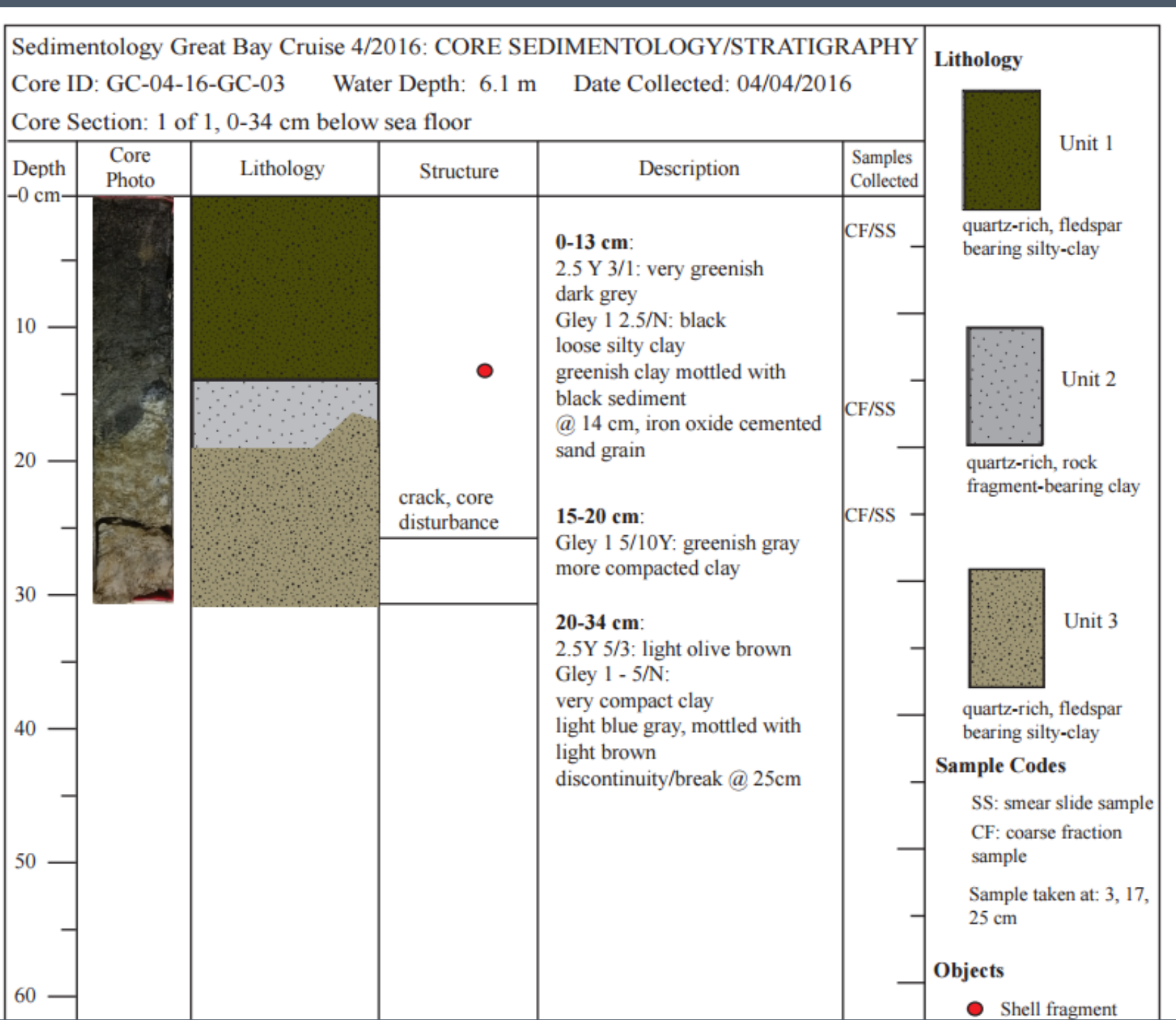
CORE DESCRIPTIONS



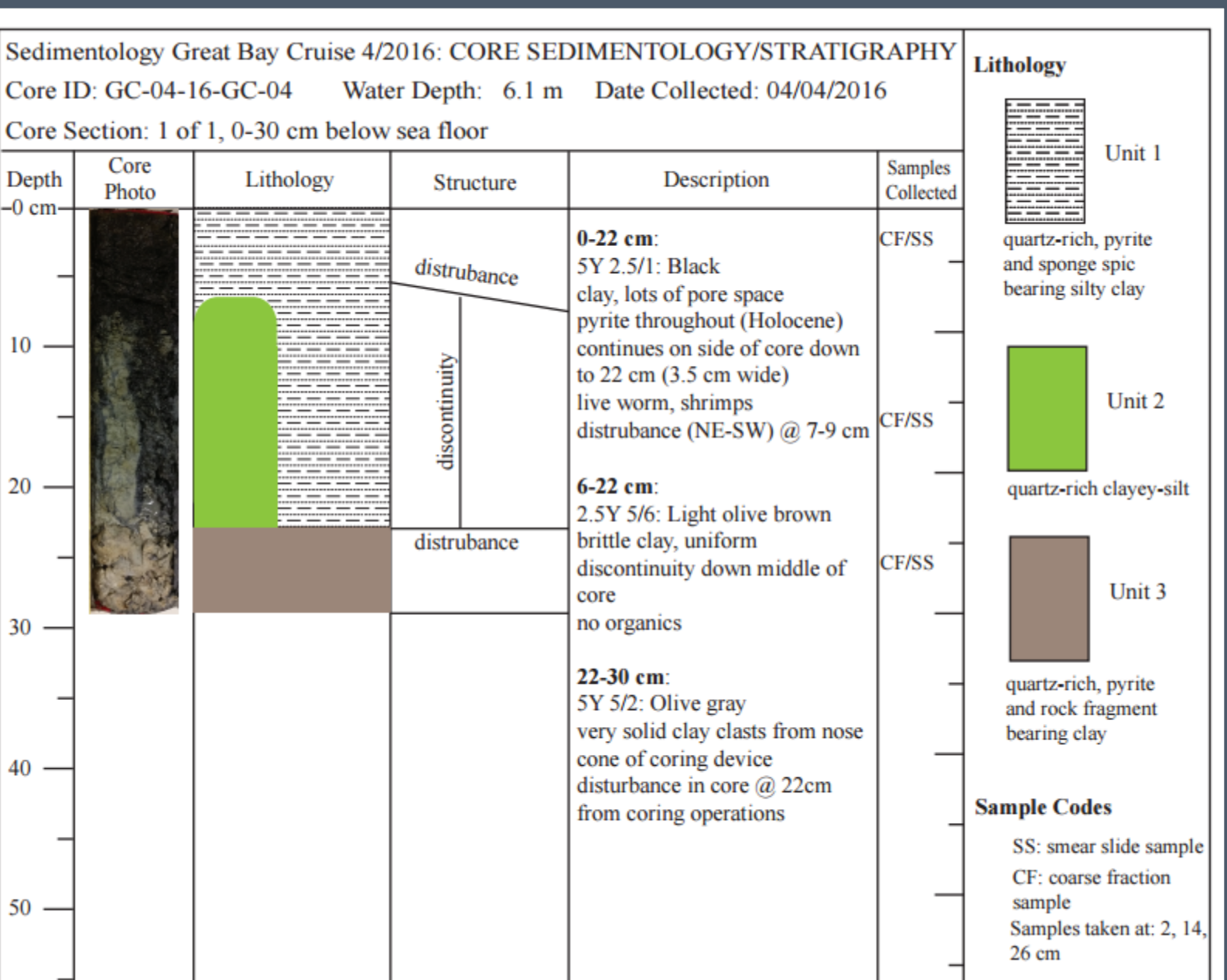
- GC-04-16-GC-01**
- Dark sandy silt fining to clay
 - Clear delineation between silt/sand fraction and clay
 - Large shell fragments in upper section



- GC-04-16-GC-02**
- Upper section consists of thin black clay layer with organic debris
 - Progressing to lighter clay with a higher lithologic content (no apparent biology)
 - Cracks in core are from separation in the core cutter and core catcher

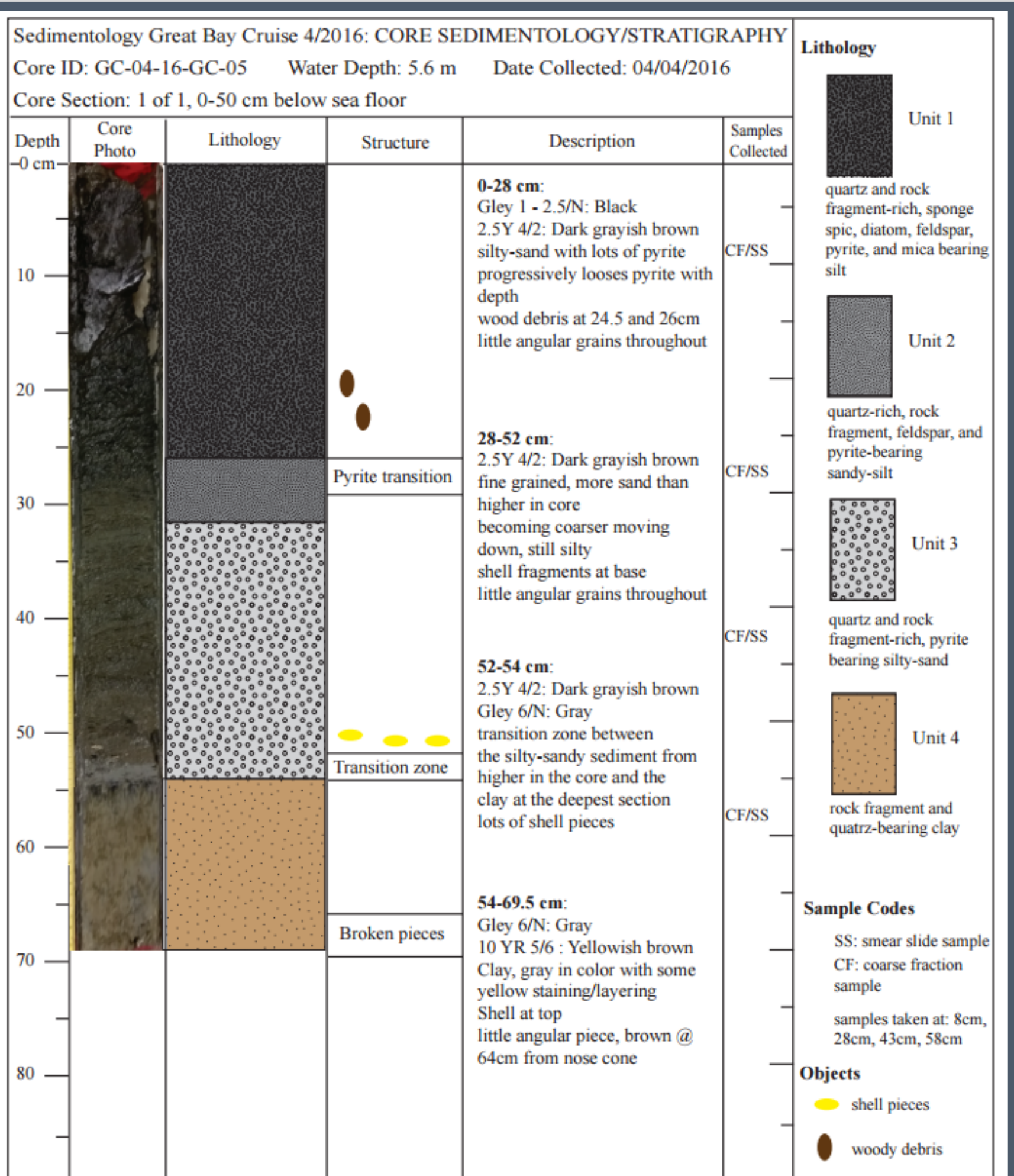


- GC-04-16-GC-03**
- Silty clay fining to clay down-core, with some iron oxide cementation
 - Deeper clay is extremely compact
 - Vertical disturbance (origin unknown) modifies middle layer but not upper section



- GC-04-16-GC-04**
- Pyrite-rich sandy silt fining to clay
 - Large vertical disturbance (source unknown) from 7 to 22 cm divides core laterally

- GC-04-16-GC-05**
- Pyrite-rich sandy silt fining to clay
 - Woody debris and shell fragments at 25 and 50 cm



INTRODUCTION

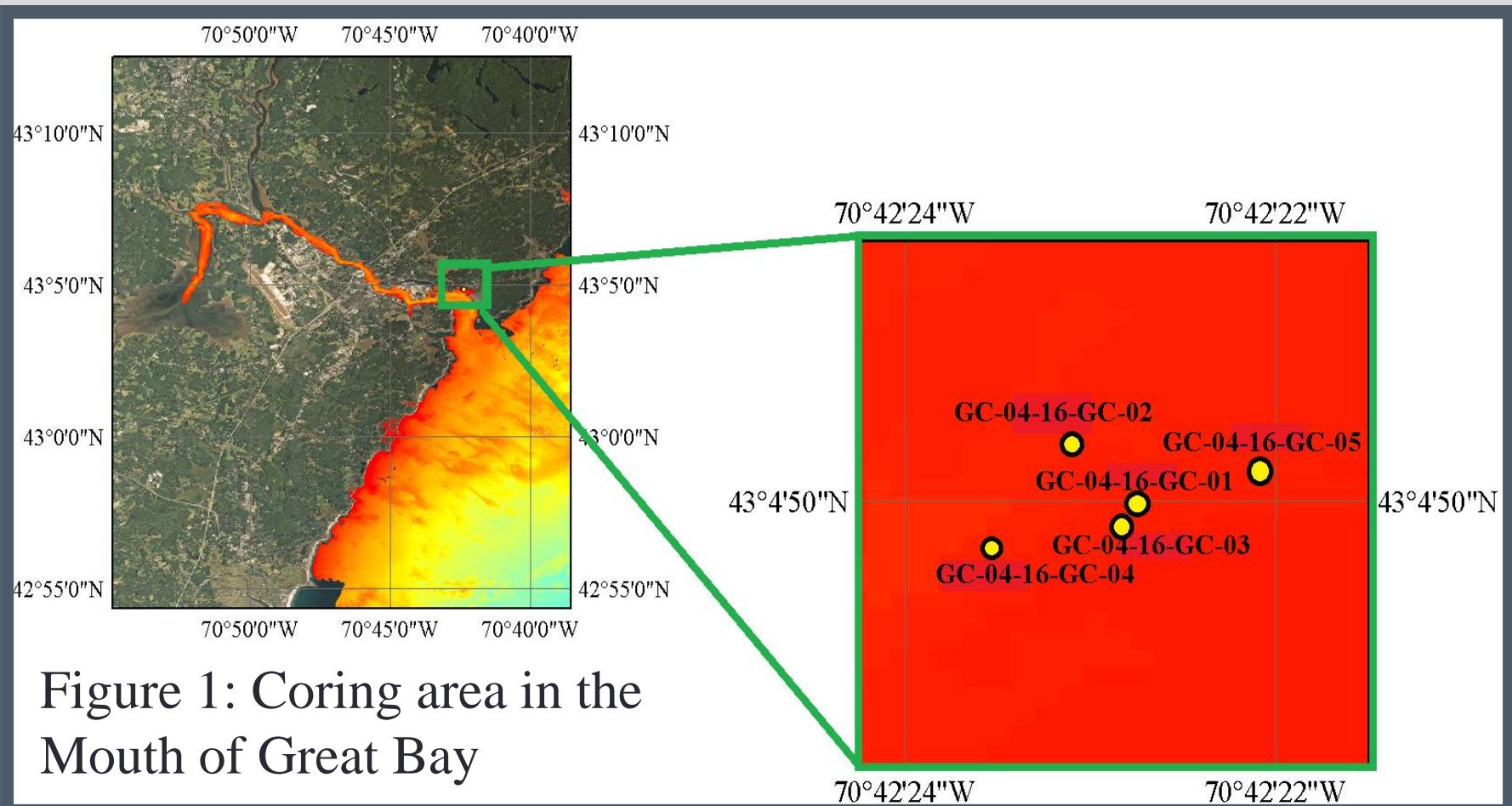
Sediments collected from the mouth of Great Bay Estuary in New Hampshire. Their lithological and biological constituents were examined in an effort to understand the area's sedimentary history.

Objectives of the Smear Slide/Coarse Fraction Team (SSCFT):

- To describe and explain the lithological variation between the Presumpscot formation and the overlying Holocene sediments
- To better understand the depositional environment² (glacial marine?) of the Presumpscot formation

METHODS

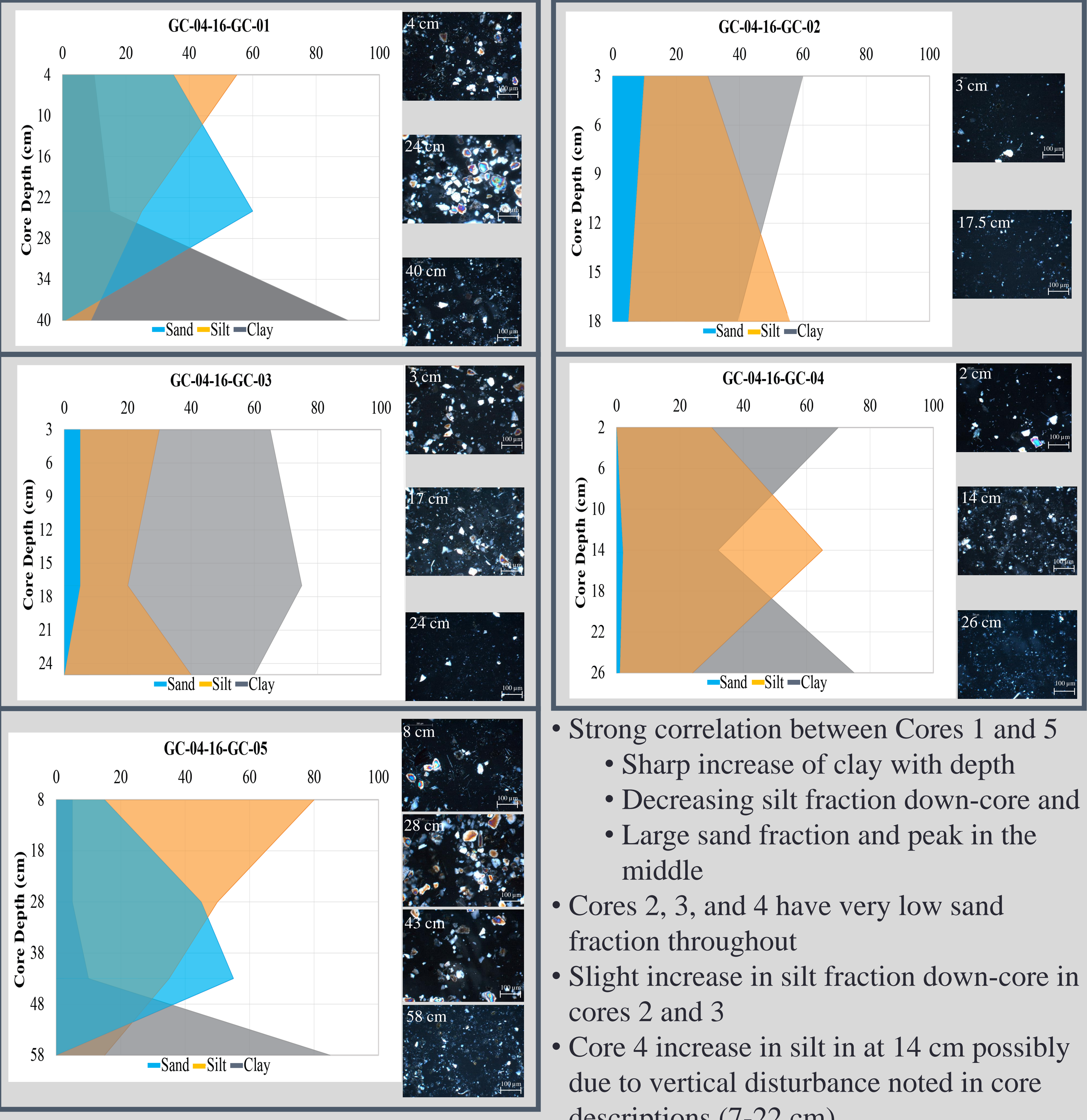
- Cruise took place on the *R/V Gulf Challenger*, on April 16th, 2016
 - 5 cores were collect in close proximity (Figure 1) in the mouth of the Piscataqua River in New Hampshire
 - Cores ranged in length from 29 to 69.5 cm
 - Lithological and biological content of each core was examined and recorded in a core description sheet
 - 15 smear slides and coarse fractions were collected (30 total), sample location was based on core description sheets
 - Leica DM705P polarized light microscope and American Optical Spencer Series 10 Binocular Microscope were utilized
 - SSCFT identified the lithological constituents using *Minerals and Mineraloids in Marine Sediments: An Optical Identification Guide*⁴
 - Microfossil content was identified by SSCFT using *Elsevier's Microfossil Wall Chart*³
- Figure 1: Coring area in the Mouth of Great Bay



ACKNOWLEDGEMENTS

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GRAIN SIZE



- Strong correlation between Cores 1 and 5
 - Sharp increase of clay with depth
 - Decreasing silt fraction down-core and
 - Large sand fraction and peak in the middle
- Cores 2, 3, and 4 have very low sand fraction throughout
- Slight increase in silt fraction down-core in cores 2 and 3
- Core 4 increase in silt in at 14 cm possibly due to vertical disturbance noted in core descriptions (7-22 cm)

UNIQUE SPECIMENS

Core 5, 58cm

Botryoidal Pyrite:
Formed *in-situ* (too fragile for transport) in a marine environment (sulfur in seawater)

Core 4, 2cm

Reophax¹:
Foraminifera found only in brackish waters

Core 4, 14 cm

Core 4, 2 cm

Core 4, 26 cm

Core 5, 58 cm

Zircon: Found in both the Holocene and Presumpscot samples. Indicative of a terrestrial source.

Core 5, 8 cm

Woody debris:
Found in upper portions of several cores. Terrestrial proxy.

Core 5, 8 cm

Quartz!
Found in every core. 14 out of 15 cores (93%) are quartz-rich.

CONCLUSIONS

- **Terrestrial influence** for both Presumpscot and Holocene:
 - Zircon, woody debris, mineral assemblage (quartz, pyrite, mica, rock fragments)
- Indications of **marine depositional environment** for both Presumpscot and Holocene:
 - Marine biota is found in both lithological units
 - Biological fraction higher in Holocene sediments
 - *Reophax*¹ – brackish/estuarine, not open ocean
 - Lack of planktonic foraminifera due to potentially inhospitable environment
- Well sorted and quartz-rich signatures in all cores due to **local, long-lived sources** and **glacial** depositional setting

REFERENCES

- (1) Armstrong, H. A. and M.D. Brasier. Microfossils: Second Edition. Oxford: Blackwell Publishing, 2005. Print.
- (2) Bloom, A.L. 1963. "Late Pleistocene Fluctuations of Sealevel and Post Glacial Crustal Rebound in Coastal Maine." *American Journal of Science*, 261: 862-879.
- (3) Koning, F.G. Elsevier's Microfossil Wall Chart. Amsterdam: Elsevier Science Publishers DB, 1993. Print.
- (4) Rothwell, R.G. Minerals and Mineraloids in Marine Sediments: An Optical Identification Guide. London: Elsevier Science Publishers LTD, 1989. Print.