Fish Tales of Newtown Creek
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SUMMARY:
Newtown Creek is a 3.8 mile heavily industrialized waterway separating Queens and Brooklyn, NY. Designated a Superfund site in 2010, it remains significantly polluted and subject to frequent sewage overflow. Here we apply environmental DNA (eDNA) metabarcoding to analyze fish presence and relative abundance at multiple sites along the Creek. To our knowledge, this represents the first fish eDNA survey of Newtown Creek and the first fish survey of any kind since 2001.

BACKGROUND:
Despite strong government and community interest in restoring Newtown Creek, relatively little is known about fish species presence and abundance and whether these have changed with cleanup efforts. The most recent surveys were conducted in 2001 (6). These included ichthyoplankton tows for fish eggs and larvae, performed at 3 sites over 4 months, which with cleanup efforts. The most recent surveys were conducted in 2001 (6). These included ichthyoplankton tows for fish eggs and larvae, performed at 3 sites over 4 months, which

METHODS:
Water samples were collected at 5 sites on Newtown Creek, ranging from upstream reach at Grand ST Bridge to mouth where Creek enters into East River (Figures 3a). In addition, water samples were also collected at East River adjacent to Rockefeller University and from laboratory tap water as a negative control (Figure 3b).

RESULTS:

Table 1 (left). Fish detected by eDNA, ranked by decreasing reads. 27 and 28 species were identified in Newtown Creek and East River samples, respectively.

Figure 7. eDNA detected a surprising diversity of fish in Newtown Creek, despite ongoing pollution and sewage overflow. The number and relative abundance of fish species differed among sites consistent with species habitat preference and pollution tolerance. For eDNA metabarcoding, we randomly selected sites along Creek transects (percent summer days greater than 3.0 mg/L at bottom), prior to

CONCLUSIONS:
eDNA detected a surprising diversity of fish in Newtown Creek, despite ongoing pollution and sewage overflow. The number and relative abundance of fish species differed among sites consistent with species habitat preference and pollution tolerance. Our data support eDNA as a cost-effective, non-destructive method for monitoring fish populations and assessing habitat restoration efforts in Newtown Creek and other Superfund sites.

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REFERENCES:
3. Head of Creek

Figure 1. Newtown Creek at Greenpoint AVE Bridge (sampling site 2, see Methods for map).

Figure 2. Newtown Creek at Nature Walk (sampling site 3, see Methods for map).

Figure 3. Dissolved oxygen concentration along Creek transects (percent summer days greater than 3.0 mg/L, at bottom), prior to installation of aeration systems (1).

Despite strong government and community interest in restoring Newtown Creek, relatively little is known about fish species presence and abundance and whether these have changed with cleanup efforts. The most recent surveys were conducted in 2001 (6). These included ichthyoplankton tows for fish eggs and larvae, performed at 3 sites over 4 months, which identified 18 species (9-12 per site), and trawl and gill net tows done at 1 site in 1 month, which found 3 fish species.

Figure 4. Water collection sites on Newtown Creek (a) and East River (b).

One L surface samples were collected at multiple sites along the Creek. To our knowledge, this represents the first fish eDNA survey of Newtown Creek and the first fish survey of any kind since 2001.

Figure 5. Water collection. A) Water collection sites on Newtown Creek and East River samples, ranked by decreasing reads. B) DNA reads for individual species at Newtown Creek and East River sites.

Figure 6. DNA was amplified with vertebrate metabarcoding primers targeting a 110 bp segment of mitochondrial 12S gene. Samples were indexed with NEXTERA XT kit, visualized on gel (Figure 6) and sequencing was done with MiSeq 2 x 150bp at AZENTA. Demultiplexed fastq files were processed with a DADA2 pipeline.

Figure 8 (left). Fish reads (a) and number of species (b) obtained from Newtown Creek and East River samples.

Figure 9 (below). Reads for individual species at Newtown Creek and East River sites.