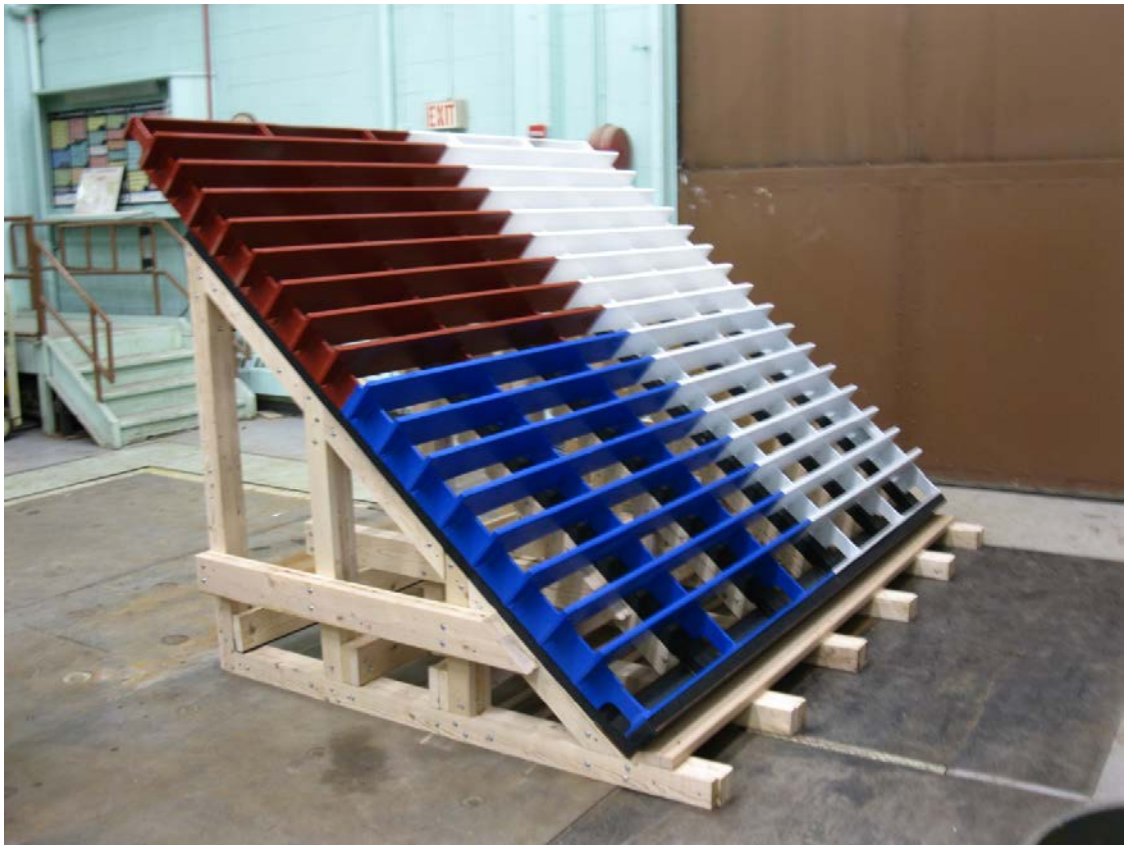
RECLAMATION

Managing Water in the West

Technical Memorandum No. MERL-2014-67

Foul Release Coatings Scale-Up Testing – Parker Dam Trashrack: Fiscal Year 2014 Report



U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

July 2014

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Acknowledgements:

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BUREAU OF RECLAMATION
Technical Service Center, Denver, Colorado
Materials Engineering and Research Laboratory, 86-68180

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Foul Release Coatings Scale-Up Testing – Parker Dam Trashrack: Fiscal Year 2014 Report

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SUMMARY

In 2012, a full-sized trashrack panel was fabricated and coated with four foul release coating systems. The goal of the project was to scale up several of the most promising foul release systems in order to assess their performance and durability characteristics under field conditions testing. Fabrication and coating work was performed by Technical Service Center staff in Denver's Materials Engineering Research Lab (MERL). Fabrication and welding presented technical challenges that required corrective active to achieve resolution. The panel was shipped to the selected field test site at Parker Dam on the lower Colorado River. Initial attempts to install the structure failed after the hired crane operator was unable to dislodge and remove the existing panels to allow installation. In December 2013, a contractor was onsite to replace the top row of trashrack panels at Parker Dam. A small contract modification was issued to allow the contractor to also replace one of the panels in the second row down with the foul release coated test panel. The installation was completed with no complications in December 2013. A scheduled inspection was performed May 23–24, 2014. So far there has been minimal fouling, as evidenced by the lack of mussel settlement on the new galvanized panels, the stainless steel control surfaces, and the foul release surfaces, and the foul release coatings are in good condition, with some minor mechanical damage observed on three of the coating systems. The inspection technique was successful in documenting the condition and performance of the coatings. The next inspection is scheduled for November 2014.

INTRODUCTION

Zebra mussels were first discovered in the United States in the 1980s in the Great Lakes. Mussels have spread rapidly across the United States into lakes and rivers. In January 2007, quagga mussels were found in Lake Mead (Hoover Dam). Since then, the mussels have spread and have been discovered elsewhere in the Colorado River as well as the Central Arizona Project. There have also been confirmed detections of zebra and quagga mussels in many other reservoirs in the Western United States. Due to the warm climate of the Southwest, mussels are able to reproduce at greater rates than in the Great Lakes Region and Upper Mississippi River Basin.

Mussels have the potential to not only disrupt water delivery and hydropower generation functions, they create long-term economic impacts as well. Mussels attach to underwater surfaces and can clog small-diameter piping (i.e., cooling water, HVAC, and domestic water piping), reduce flow in larger diameter piping, clog fish screens, and impact intake structures.

Due to the potential impacts mussels can have at Bureau of Reclamation

(Reclamation) facilities, a coatings research project was started in 2008 to identify or develop solutions to mitigate problems caused by mussels. The ongoing coatings study at Parker Dam has identified several foul release coating products that continue to effectively prevent fouling. However, facility managers remain skeptical that these coatings will withstand the severe service environment that includes abrasion, impacts, and scouring from entrained solids. The current scale-up project is intended to evaluate how coatings will perform in these conditions. Details regarding the field test site, fabrication, and coating of the scale-up panel can be found in MERL-2013-19. The panel contains four commercially available foul release coatings systems:

Topcoat	Generic coating type	Topcoat color	Location
International Intersleek 970	Fluorinated Silicone Foul Release	White	Upper left
Fuji Sher-Release	Silicone Foul Release	White	Upper right
PPG Sigmaglide 890	Silicone Foul Release	Red	Lower left
Seacoat Seaspeed V5	Seacoat Seaspeed V5	Blue	Lower right

INSTALLATION

Installation was attempted in fiscal year 2013 by plant staff using a local hired crane and operator, as noted in MERL-2013-19. The initial attempts failed, and the installation was rescheduled for December 2013 when a contractor was to replace the top row of trashrack panels.

The experimental trashrack installation was completed on December 19, 2013. It was installed in Bay 9 right side (facing downstream). There were no problems extracting the existing trashrack, and it appeared to be in good condition, with no major rusting. Note that despite the presence of an automated trash rake, significant mussel buildup was present on the existing panel (figures 1–3). Figures 4–6 show the rack being installed in Bay 9.

INSPECTION RESULTS

A scheduled inspection was performed May 23–24, 2014. A submersible camera was deployed to evaluate the degree of fouling and damage on the existing structure. This was accomplished by attaching a GoPro camera to the bars of the trashrack cleaner (see figure 7 for the mounting location). Opening the trash rake jaws tilted the camera downward and gave a broad perspective of the fouling

conditions. Closing the jaws produced a closer picture, revealing the coating condition—however, only 5–6 bar spacings were visible. During subsequent inspections, the camera may be mounted further to one side initially and then shifted to the other side for a more complete inspection.

Figures 8–13 are still images captured from the GoPro video recording. Note that there has been little to no mussel settlement on the new galvanized trashrack panel above the foul release panel. Furthermore, examination of the stainless steel "control" surfaces suspended from the downstream side of the trashrack assembly revealed that very little mussel settlement/fouling has occurred since the last examination in December 2013. Low spawning rates are typical during the cooler months at Lake Havasu. Note that existing mussel settlement remains intact during the off-season (figure 14), so the total biomass from fouling tends to accumulate, barring any mitigating factors.

It was expected that there would be some localized damage due to the automated trash rake, which runs approximately every 7 days. Dam staff estimates the rake had been run 20–25 times since the panel installation last December. While the softer silicone foul release systems are more prone to mechanical damage from gouging and abrasion, a conventional coating such as an epoxy will eventually experience damage from the high stress loading of a trash rake. However, the hope is that the damage will be contained to areas where contact from the trash rake occurred. It is possible that any damaged areas may remain free of mussels due to regular cleaning with the trash rake.

Figures 15–16 show that there is some minor damage to the International Intersleek 970 system and the PPG Sigmaglide 890 system. From figure 17, there appears to be some wear on the front face of the Sigmaglide and Seacoat Seaspeed V5 coatings. This is expected since most of the contact occurs on the front face as evidenced by figure 14. Overall, the damage is relatively minor at this point. More time is needed to determine the longevity of the coatings and whether the damage will spread to adjacent areas. The Fuji Sher-Release system does not appear to have any notable damage thus far.

REFERENCES

Foul Release Coatings Scale-Up Testing: Parker Dam Trashrack, Technical Memorandum No. MERL-2013-19, Bureau of Reclamation, Denver, Colorado, March 2013.

Figure 1.—Existing trashrack heavily fouled with quagga mussels.

Figure 2.—Existing trashrack, view looking east.

Figure 3.—Existing trashrack, view looking south on trashrack structure.

Figure 4.—Installation of the new trashrack panel.

Figure 5.—Installation of the new foul release coated panel.

Figure 6.—Installation of the new trashrack panel.

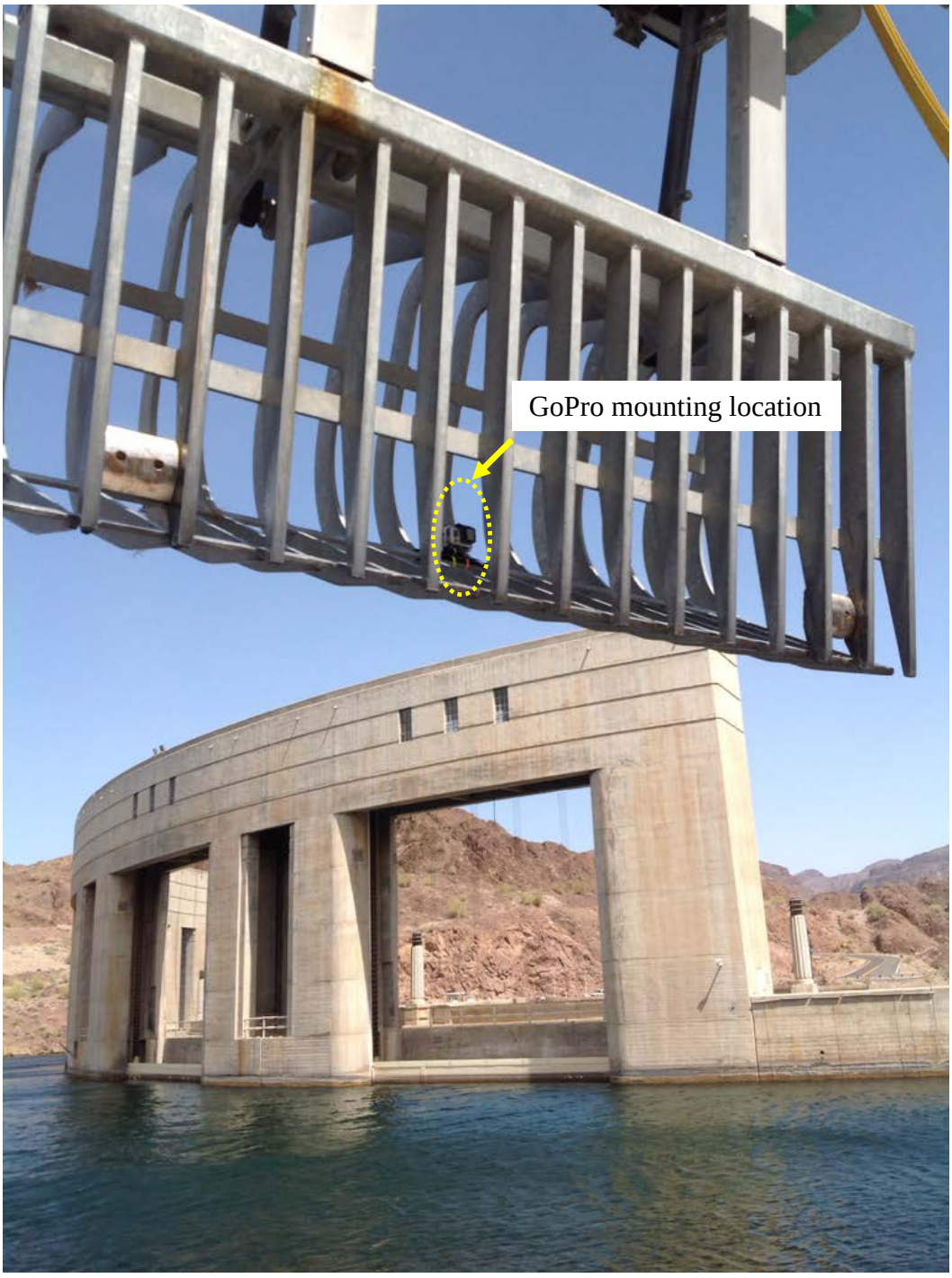

Figure 7.—Trashrack cleaner with GoPro camera mounted.

Figure 8.—Video still captured from May 2014 inspection—white International Intersleek 970 (left), white Fuji Sher-Release (right).

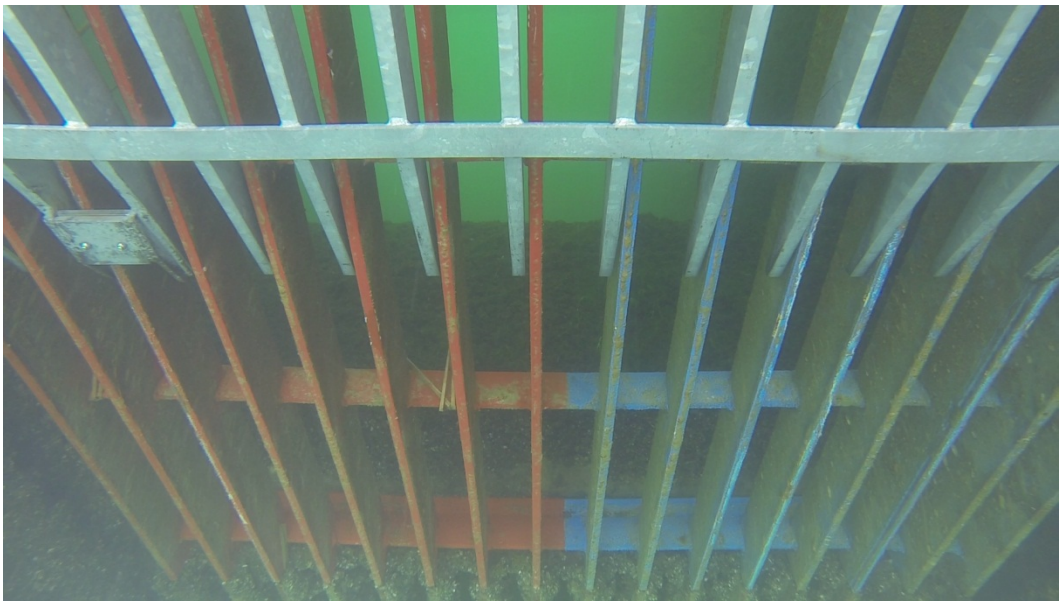

Figure 9.—Video still captured from May 2014 inspection—red PPG Sigmaglide 890 (left), blue Seacoat Seaspeed V5 (right).

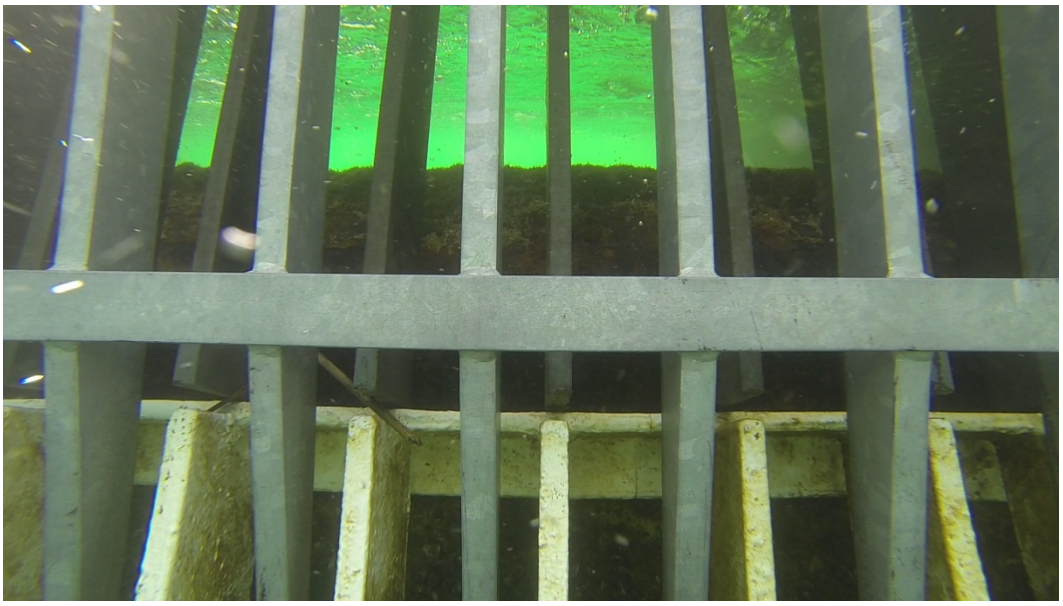

Figure 10.—Video still captured from May 2014 inspection—new galvanized panels (top), experimental foul release panel (bottom), and galvanized bars of automated trashrack cleaning system (foreground).

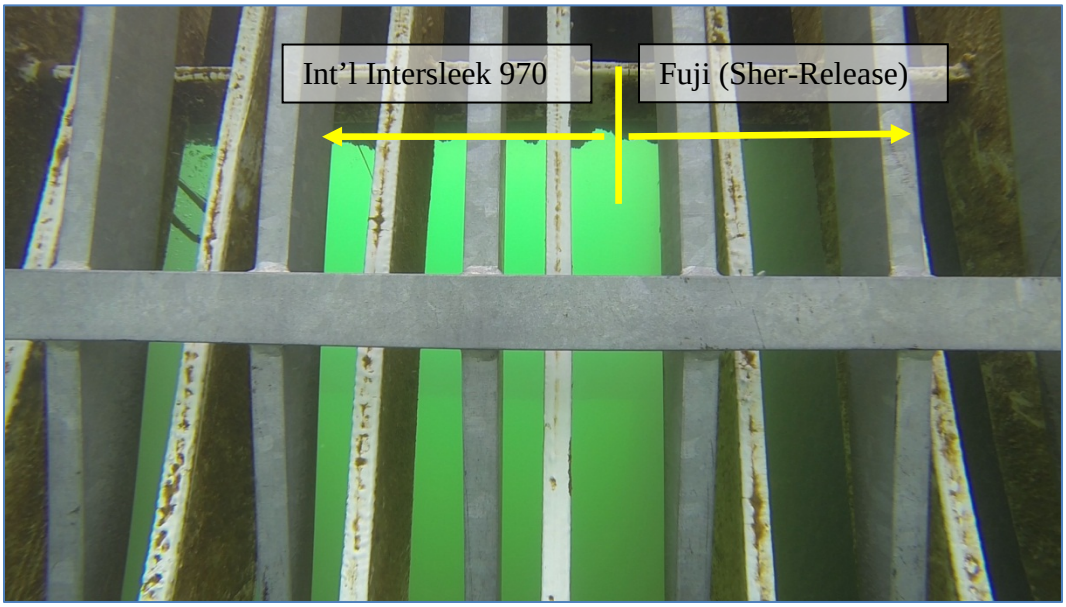

Figure 11.—Front face of the foul release panels—International Intersleek 970 (left), Fuji Sher-Release (right).

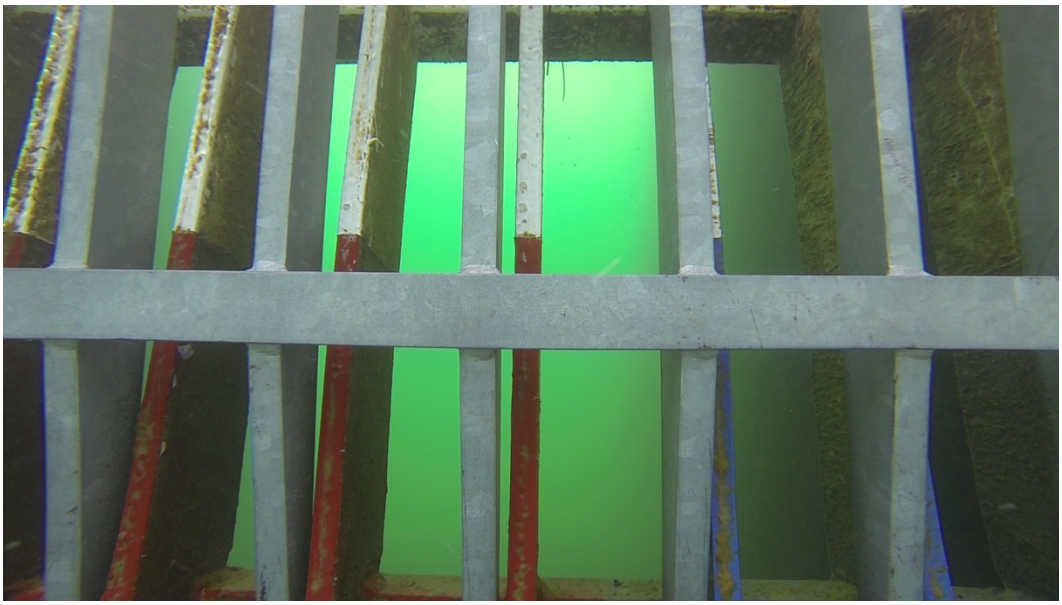

Figure 12.—Front face of the foul release panels—International Intersleek 970 (upper left), Fuji Sher-Release (upper right), red PPG Sigmaglide 890 (lower left), and blue Seacoat Seaspeed V5 (lower right).

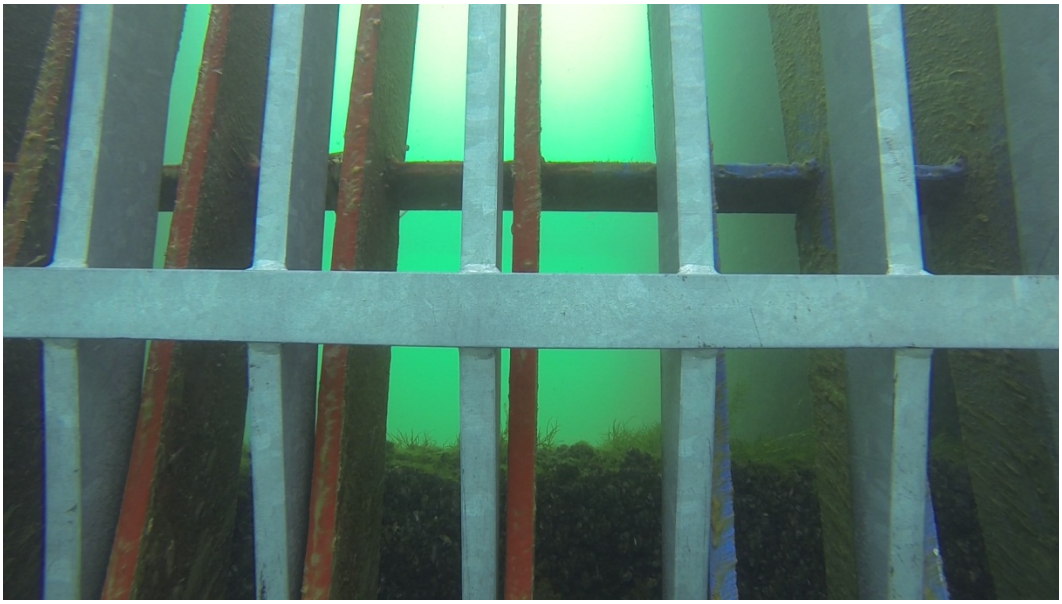

Figure 13.—Front face of the foul release panels—International Intersleek 970 (left), red PPG Sigmaglide 890 (left), and blue Seacoat Seaspeed V5 (right).

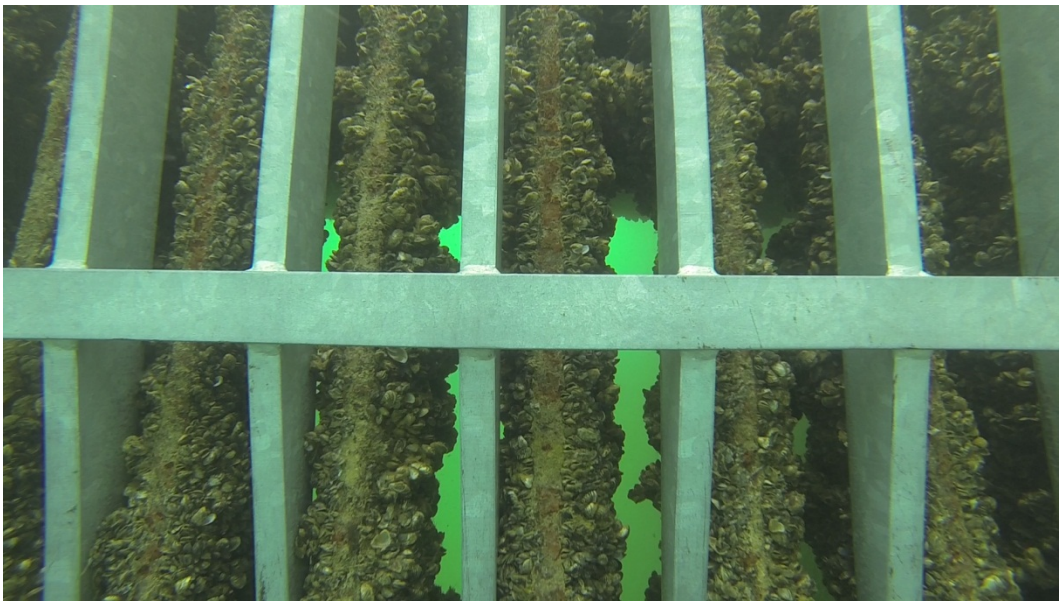

Figure 14.—Original trashrack panels in fouled condition during May 2014 inspection.

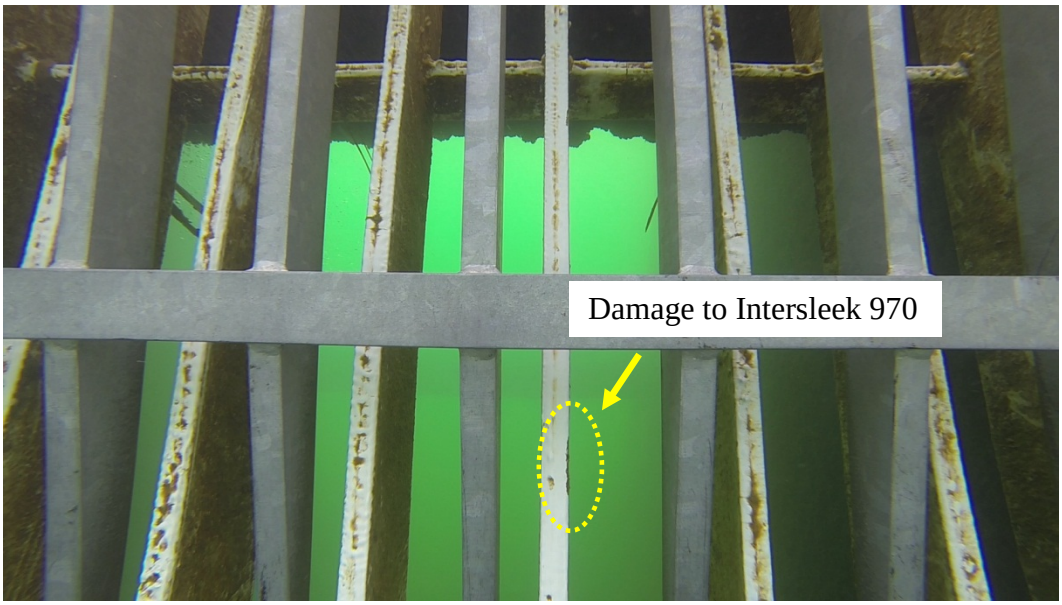

Figure 15.—Slight damage to International Intersleek 970.

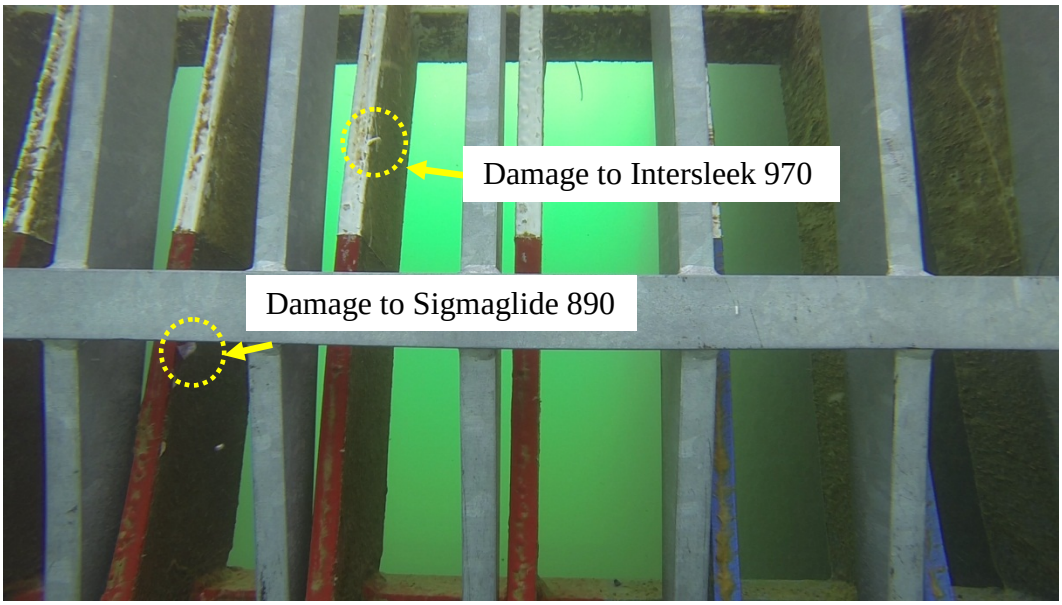

Figure 16.—Damage to International Intersleek 970 and PPG Sigmaglide 890.

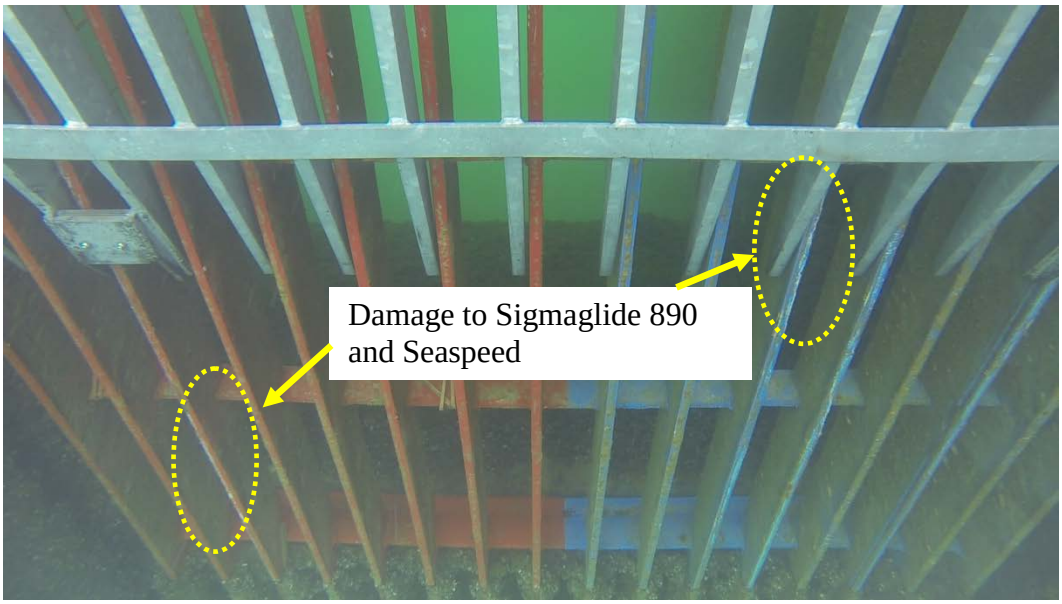

Figure 17.—Damage to International Sigmaglide 890 and Seacoat Seaspeed V5 (front face).