



## Fishy Finery

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The United Nations reported that global fish consumption reached its highest level in 2015, 20kg per capita, and its consumption is still increasing (Kinver, 7 July 2016). The increase in global consumption of fish has also led to an increase in the number of fish scales sent to landfills. Roughly 20-40kg of scales and more than 50kg of skin can be obtained from 1000kg fishes during fillet processing (Arvanitoyannis & Kassaveti, 2008). Fish scales are usually discarded, resulting in a pungent odor and environmental burden on landfills. However, fish scales have promising applications in the medical (protection, drug delivery), cosmetic (micro- and nano-scale protein ointments) and food (micro packaging) industries (Uzunoğlu & Özer, 2016; Zynudheen, 2010). Fish scales could also be utilized as apparel and furniture ornamentation.

Clearly, there is an abundance of fish scales that go to landfills as solid waste, but have possible applications for the apparel industry. An earlier research effort was undertaken to utilize the fish scales to absorb textile dye from wastewaters (Kabir, 2018). Scales of black drum (*Pogonias cromis*) were investigated to determine if they could be used for acid blue 45 dye absorption from textile wastewaters. The scales chosen for this project were collected from a processing plant in the Southeastern part of the United States of America. The plant processes 10000-20000 lbs of black drum per week and usually disposes of the scales after separating fish fillets (Kabir, 2018).

### Coloration of Scales

In the use of fish scales for acid blue 45 dye removal, a sample dye wastewater solution was prepared following the wool dyeing recipe, which contained acid and salt in addition to dye. The absorption process was optimized using different process variables such as dye concentration, amount of scale used, scale sizes (from fine powder to pristine scales), temperature, stirring etc. The absorption process was also investigated without using acid and salt.

Results revealed that large-size scales (pristine scales) without any additives (acid and salt) in the dye wastewater solution showed the best dye removal performance. Moreover, the presence of salt and acid in the dye solution made the scales crunchy when they were dried after dye absorption. Thus, the larger scales were found to be the best at absorbing dye from wastewater that did not contain salt or acid (Kabir, 2018). While the scales were good at absorbing the dye, a sustainability problem still existed as there was no use for the final dyed fish scales.

### Design Development

The purpose of this design was to achieve a more sustainable outcome for the wastewater dyed fish scales by utilizing them on a garment. The aesthetics of the fish scales served as the major source of inspiration for the garment. The design process began with an exploration of

potential methods for applying the fish scales, which were about the size of a dime and fairly thick like a fingernail. Eventually, it was determined that slicing a hole in each side of the scale using a seam ripper was the best way to create holes. Hand stitching the scales down with beads allowed for the most uniform look.

As the fish scales were colored by wastewater dye, there was nice color variation in the scales. It was decided that creating a design using hand dyeing techniques would be a good way to mimic the organic-looking coloration of the scales. The designer wanted to create an evening gown to demonstrate the beauty of the scales. The gown was designed to rely on the half-circle shape as a further nod to the inspiration of the actual fish scales. Using the same shape in one garment in different scales has been shown to be a pleasing approach to design (Ohrn-McDaniels, 2013).

Ultimately it was determined that using up-cycled fabrics was the best way to stay in line with the sustainable purpose of the design. A trip to a local second-hand sale yielded one tulle and acetate wedding gown and ten additional wedding veils. The veils fit the half-circle shape requirement for the garment. The materials were then dyed in four different dye baths to create variation in the colors of the gown from blue to grey.

The gown was draped on a dressform in muslin and a first fitting was done. Next, the bodice was cut from the dyed acetate underskirt of the up-cycled wedding gown. Each piece was interfaced to provide support and to stabilize the fabric. Boning was also added to an underlining. Next, the tulle veils were draped on the dressform to determine how they should be combined to create the skirt. Each veil was stitched to the gown and the longest veil was draped in a swag over the entire skirt. Additional volume was created for the skirt by sewing two overskirts from the wedding dress to the lining of the design.

Next, the “scales” were created. Each one was covered in tulle scraps from the wedding dress and then the fish scales were hand sewn onto the edges. The shapes were then arranged on the gown and sewn by hand to the bodice. Finally, an invisible zipper was added to the center back.

### Contribution

In conclusion, this garment is an exemplary representation of sustainability. Fish scales, which would have gone to the landfill were utilized to absorb wastewater dye that negatively impacts the water system. Then, these dyed scales were used to inspire a new design that was created using up-cycled materials. Future design research should investigate further application methods for the fish scales including fusing and machine sewing possibilities.

### References

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