## HDPE Geomembranes Used in Fish Rearing Ponds Suspected in Causing Shifted Sex Ratios

By GNA Editor









4 ATMP

TEMPO

**2,4 DTBP** 



The University of Wisconsin-Stevens Point's Northern Aquaculture Demonstration Facility—renowned for its innovative work in sustainable fish farming—has observed a puzzling and disturbing trend: walleye raised in HDPE-lined ponds are showing heavily female-skewed sex ratios, while those reared in traditional clay-lined ponds exhibit a balanced distribution.

Coincidence? Emerging science suggests otherwise.

## The Plastic Problem Beneath the Surface

HDPE geomembranes have become the industry standard for lining fish ponds due to their durability and resistance to chemicals. But recent concerns are turning the spotlight on what these polymers may be releasing into aquatic environments—particularly as they degrade over time.

New investigations are examining the endocrine-disrupting potential of degradation by-products from common additives in HDPE liners. These include:

- 2,4-di-tert-butylphenyl (2,4 DTBP), a known breakdown product of the antioxidant Irgafos 168, which has demonstrated estrogenic activity in vitro (Shi et al., 2020).
- Hindered Amine Light Stabilizer (HALS) by-products such as:
  - Alkylated piperidines
  - Nitroxyl radicals like TEMPO
  - Carboxylated derivatives with high environmental persistence (Deng et al., 2024).

These compounds, once leached into the water, may mimic or interfere with natural hormones, disrupting the endocrine systems of aquatic organisms— potentially feminizing male fish or skewing reproductive development.

## Déjà Vu in Endocrine Disruption

This situation bears a striking resemblance to earlier discoveries of endocrinedisrupting effects for example BPA from polycarbonate Petri dishes and styrene trimers from polystyrene Petri dishes which were only identified when researchers transitioned away from inert glass Petri dishes to plastic ones.

The transition from PVC to HDPE liners in aquaculture may be echoing this scientific déjà vu.

Chemical analyses have detected fragments of these stabilizers in water correlating strongly with known endocrine-disrupting compounds reported in the scientific literature. This isn't just theoretical. It's a real biological impact with observable gender changes in fish populations.

Fish farmers, environmental agencies, and aquaculture product suppliers must confront a difficult question: Are the very materials we use to protect and contain aquatic life instead subtly altering their biology?

The answer may lie in ongoing and future research—but the early warning signs are unmistakable.

The Northern Aquaculture Demonstration Facility is now designing rigorous studies known as designed experiments to evaluate the presence and effects of these compounds on fish hormone pathways and sex differentiation. If confirmed, this would have profound implications not just for aquaculture, but for broader environmental health and food safety.

It's time to take a closer look at what's leaching from HDPE liners.

Because what lies beneath the surface could be changing more than just the water.

## **References and Further Reading**

Geosynthetic News Alerts (GNA) Special Feature February 2025 Vol. 4:

<u>Serious Safety Issues Emerge Over Use of Common Additives in HDPE</u> <u>Geomembranes [PDF]</u>

Shi, J., et.al. (2020) *Environ Sci. Technol.* 54, 10570 (2020). https://pubs.acs.org/doi/10.1021/acs.est.0c03709

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Common Antioxidant in Most Geosynthetics Found to Decompose by Multiple Pathways - ExcelPlas - Polymer Testing | Polymer Analysis | Geomembrane Testing | Plastics Analysis - ExcelPlas

