Florida Department of Environmental Protection

A COMPARISON BETWEEN NOTOX AND FORMALIN PRESERVATION EFFECTIVENESS IN FRESHWATER BENTHIC MACROINVERTEBRATE SAMPLES

30 March 2016





ABSTRACT

FLDEP Stakeholders have asked about the possibility of using NOTOXhisto® (NoTox), a non-formalin-based fixative, in place of formalin for preserving macroinvertebrate samples.

DEP conducted a study to determine the effectiveness of NoTox on freshwater macroinvertebrate preservation as compared to formalin preservation; the DEP standard.

Two SCI samples were collected from Mule Creek, Liberty County, FL on 5/26/2015 and two SCI samples from Yon Creek, Gadsden County, FL on 5/29/2015. One sample from each site was preserved in NoTox and the other in formalin. Samples were analyzed 3 months afterwards.

Other macroinvertebrates were hand collected at the sites and placed into jars containing either NoTox or formalin. The individuals from these containers were examined at 1 week, 1 month, 3 months, and 6 months post sampling. In addition to the aforementioned sites, macroinvertebrates were hand collected at McBride Slough, Wakulla County, FL on 6/17/2015.

METRICS

Metrics examined were:

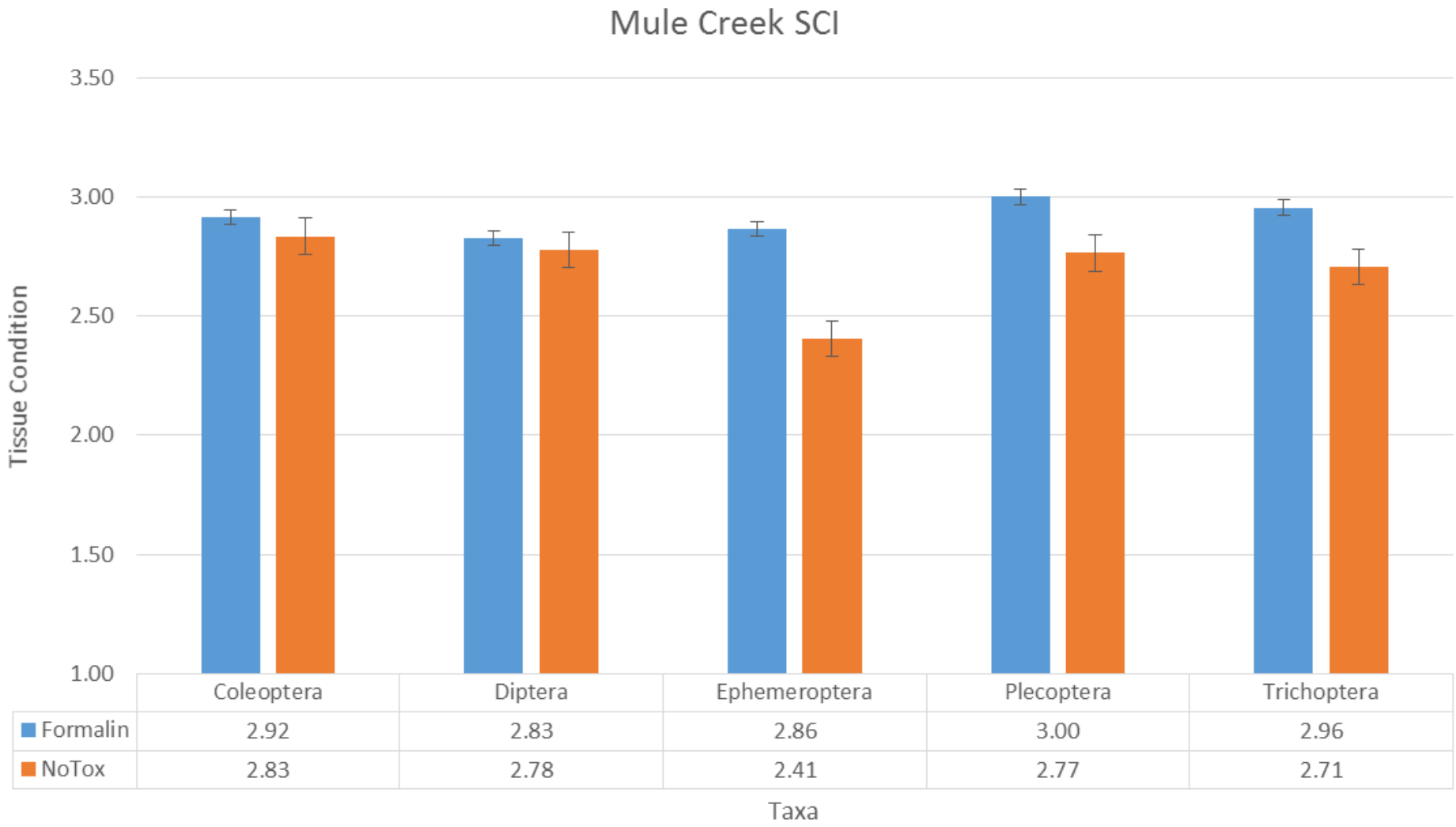
- Color: Normal (N) or Abnormal (A)
- Tissue Condition: Disintegrating (1), Soft (2), Firm (3), and Brittle (4)
- Life Stage: Early Instar (1), Mid Instar (2), Late Instar (3), and Adult (4)
- Condition Of Body: Poor (1), Acceptable (2), and Very Good (3)
- Identifiability: Cannot ID (1), Difficult to ID (2), and Easy to ID (3)

COLOR

Color differences between Formalin preserved animals and NoTox preserved animals were mostly unremarkable. Decapods were most likely to change color when preserved, and they often changed color in both preservatives. They usually turned a darker orange in NoTox samples. This color change did not affect The Taxonomists' ability to identify the animals.

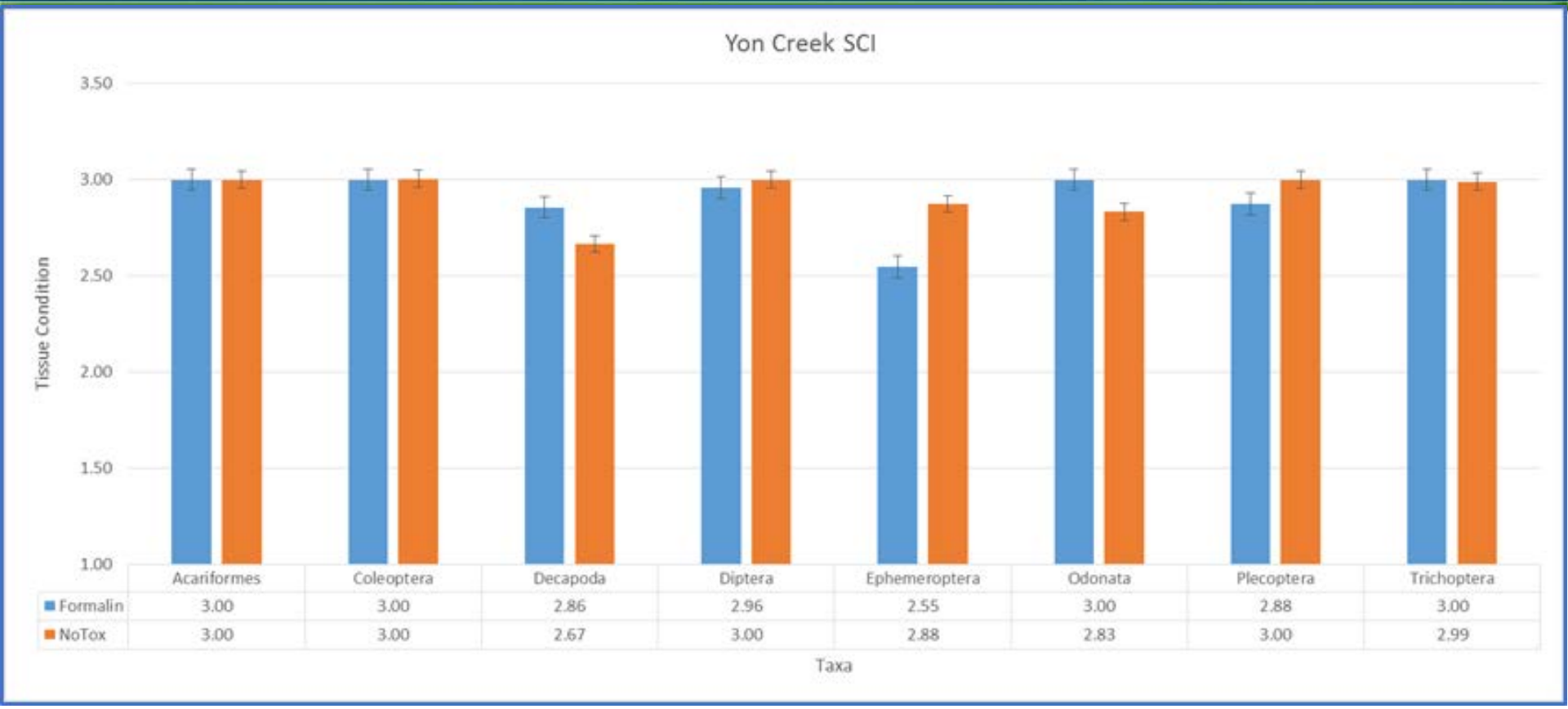
Color comparison between crayfish. NoTox (Top) and Formalin (Bottom)

Tissue Condition For The SCI Samples At 3 Months (Mule)



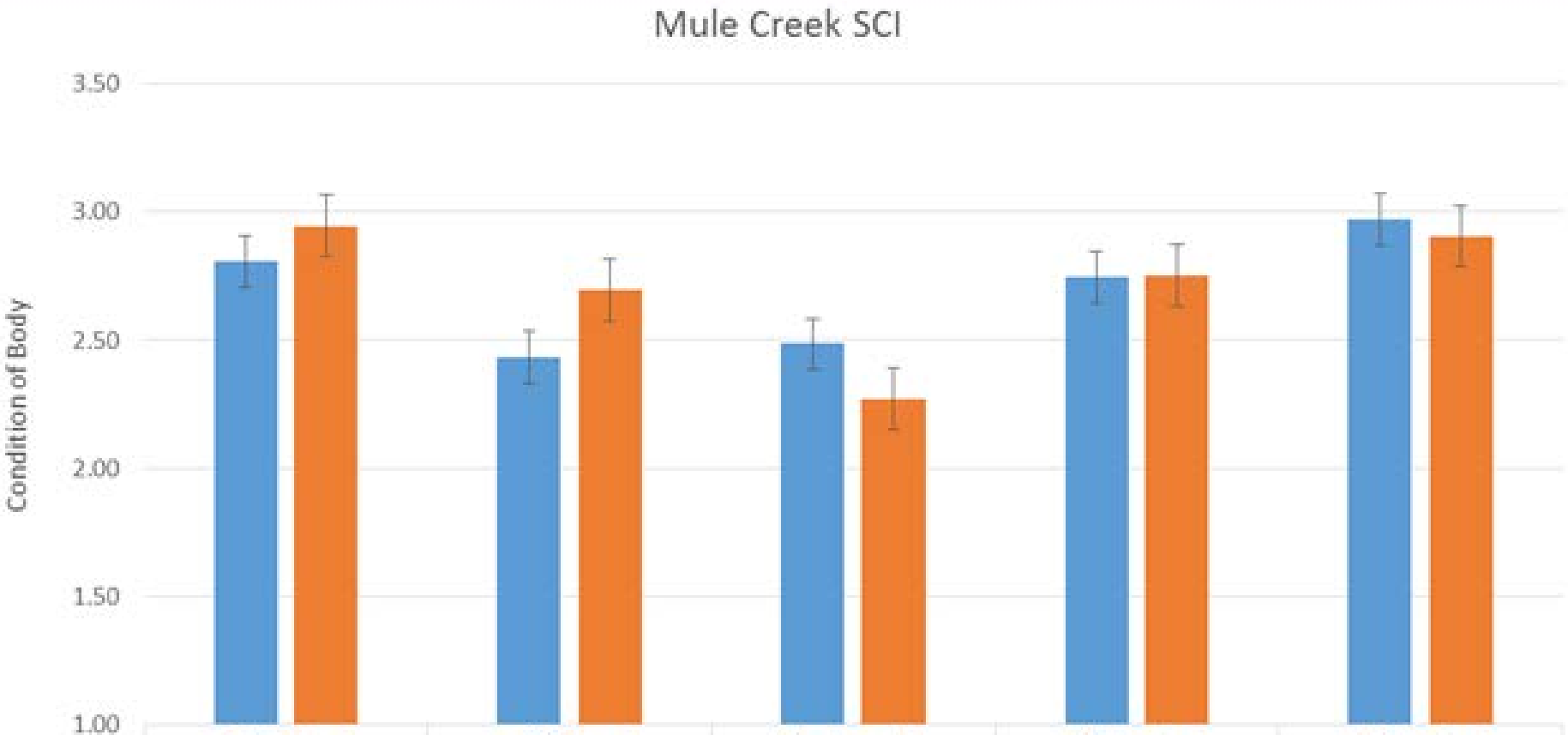
	Coleoptera	Diptera	Ephemeroptera	Plecoptera	Trichoptera
Formalin	2.92	2.83	2.86	3.00	2.96
NoTox	2.83	2.78	2.41	2.77	2.71

Tissue Condition For The SCI Samples At 3 Months (Yon)

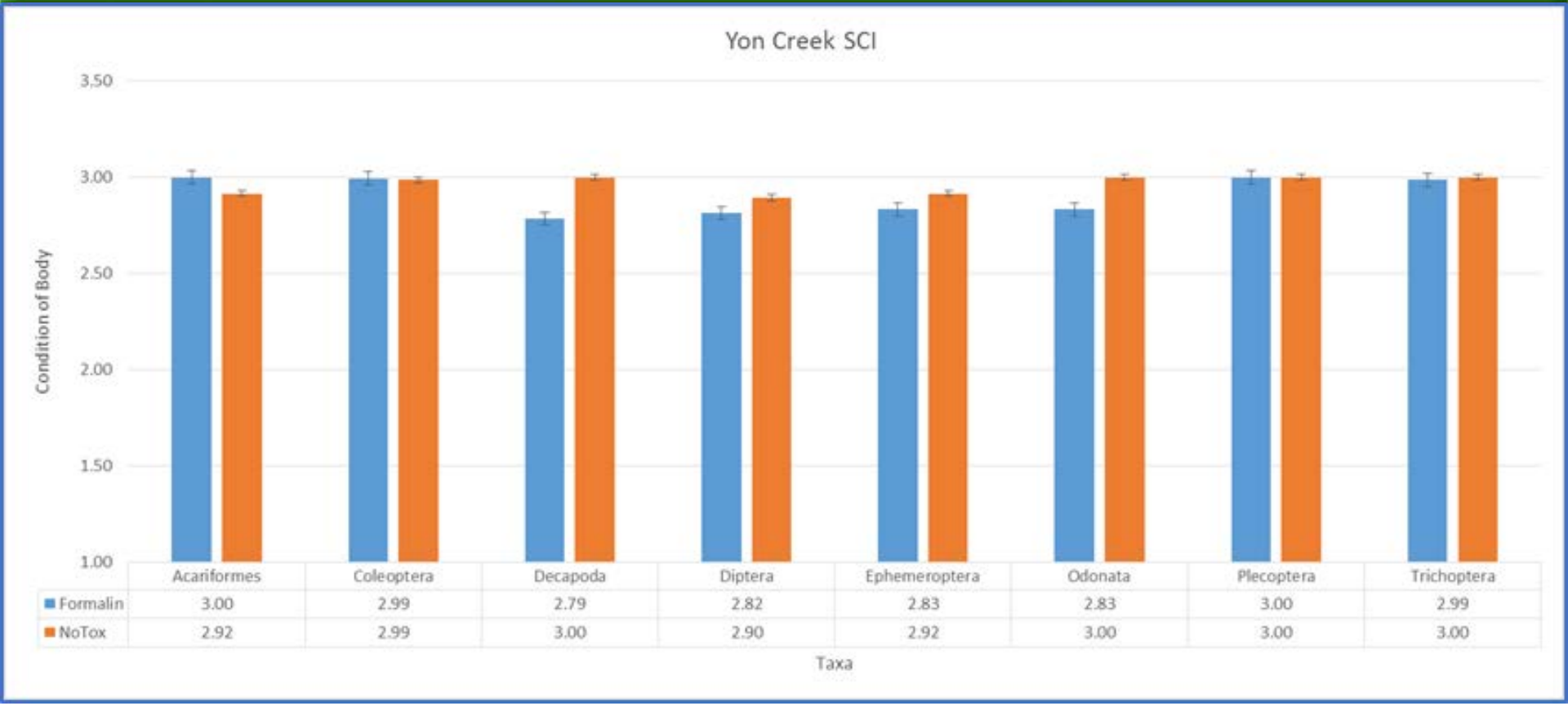


	Acariformes	Coleoptera	Decapoda	Diptera	Ephemeroptera	Odonata	Plecoptera	Trichoptera
Formalin	3.00	3.00	2.86	2.96	2.55	3.00	2.88	3.00
NoTox	3.00	3.00	2.67	3.00	2.88	2.83	3.00	2.99

Body Condition For The SCI Samples At 3 Months (Mule)



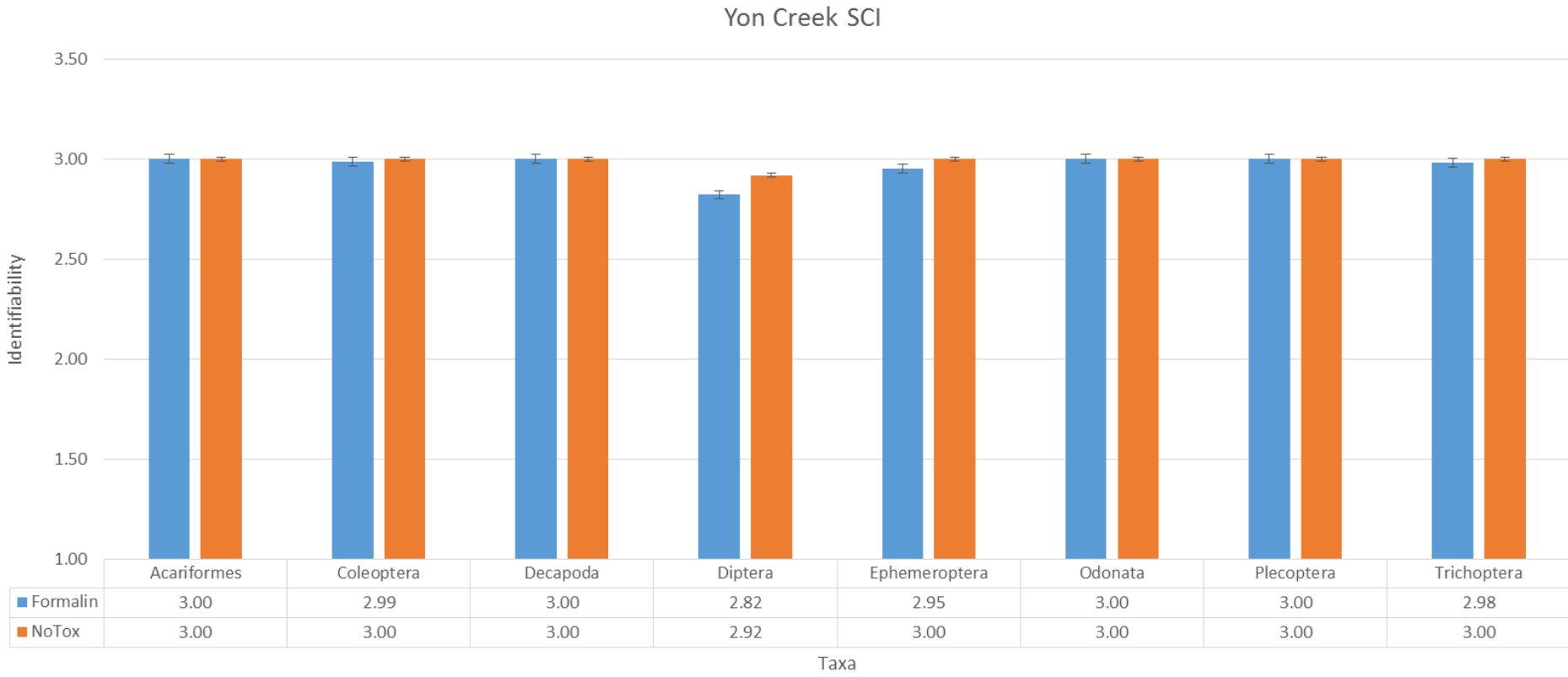
Body Condition For The SCI Samples At 3 Months (Yon)



	Acariformes	Coleoptera	Decapoda	Diptera	Ephemeroptera	Odonata	Plecoptera	Trichoptera
Formalin	3.00	2.99	2.79	2.82	2.83	2.83	3.00	2.99
NoTox	2.92	2.99	3.00	2.90	2.92	3.00	3.00	3.00

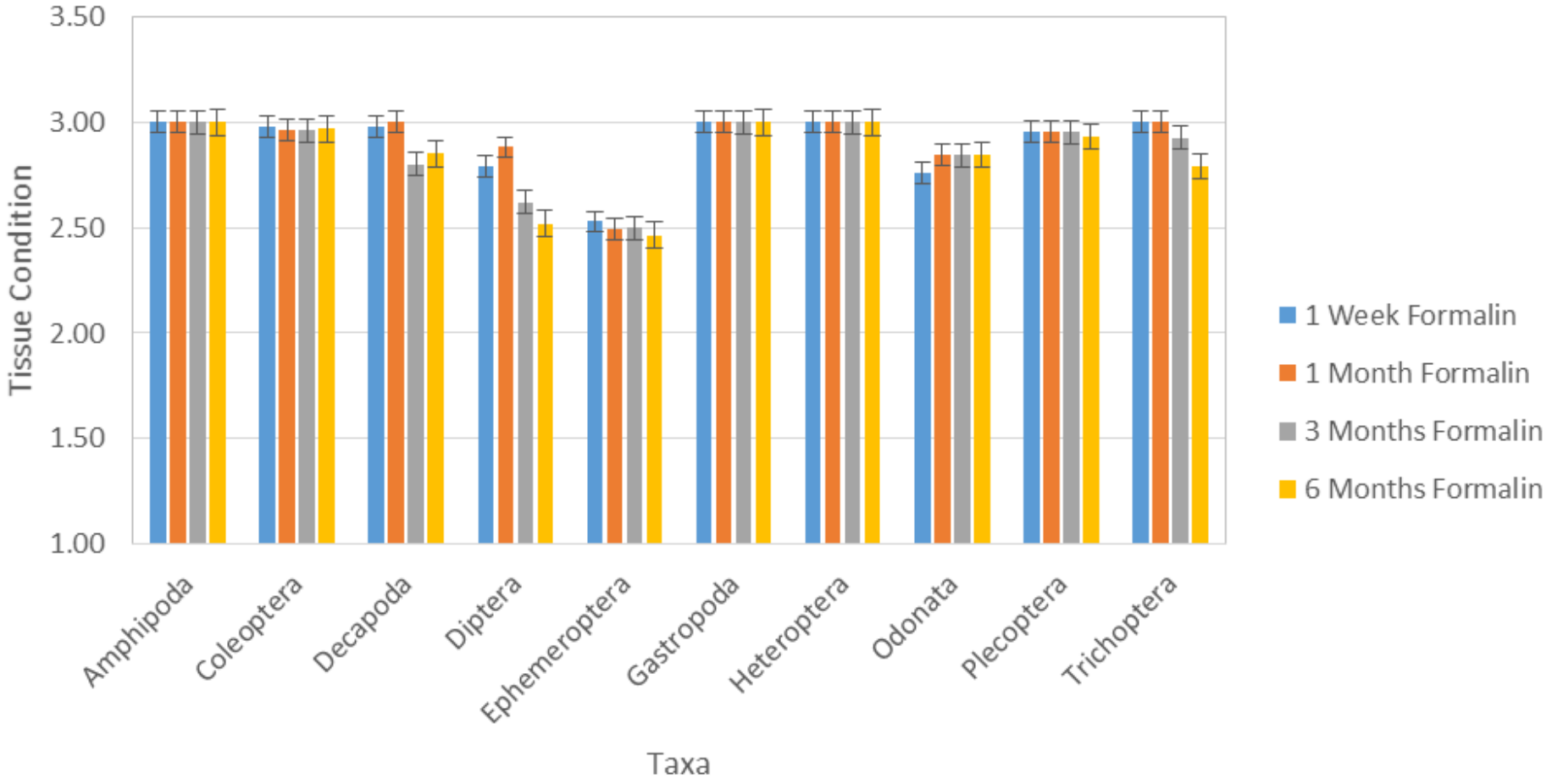
Identifiability For The SCI Samples At 3 Months (Mule)

Identifiability For The SCI Samples At 3 Months (Yon)

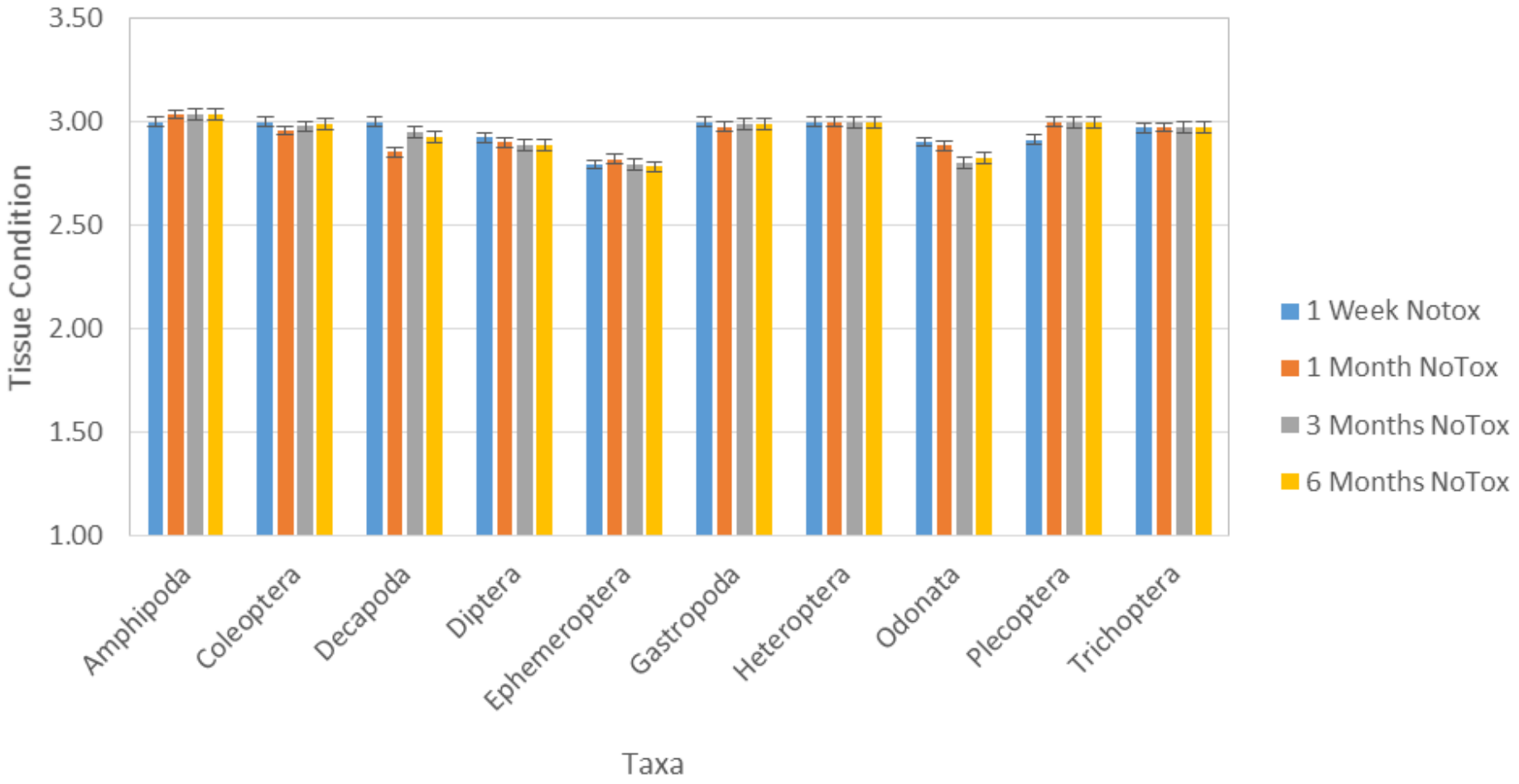


	Acariformes	Coleoptera	Decapoda	Diptera	Ephemeroptera	Odonata	Plecoptera	Trichoptera
Formalin	3.00	2.99	3.00	2.82	2.95	3.00	3.00	2.98
NoTox	3.00	3.00	3.00	2.92	3.00	3.00	3.00	3.00

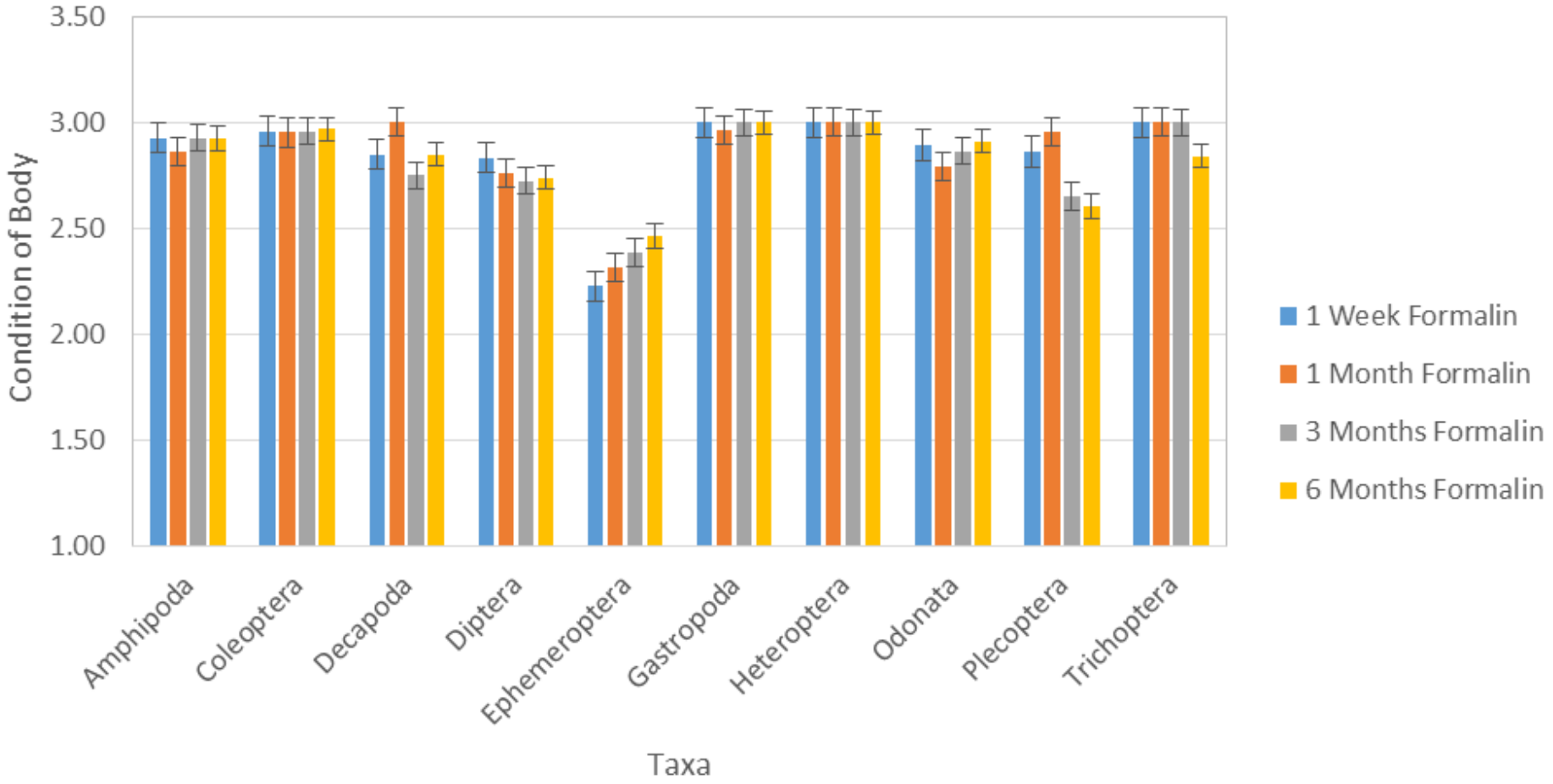
Tissue Condition Over 6 Months (Formalin)



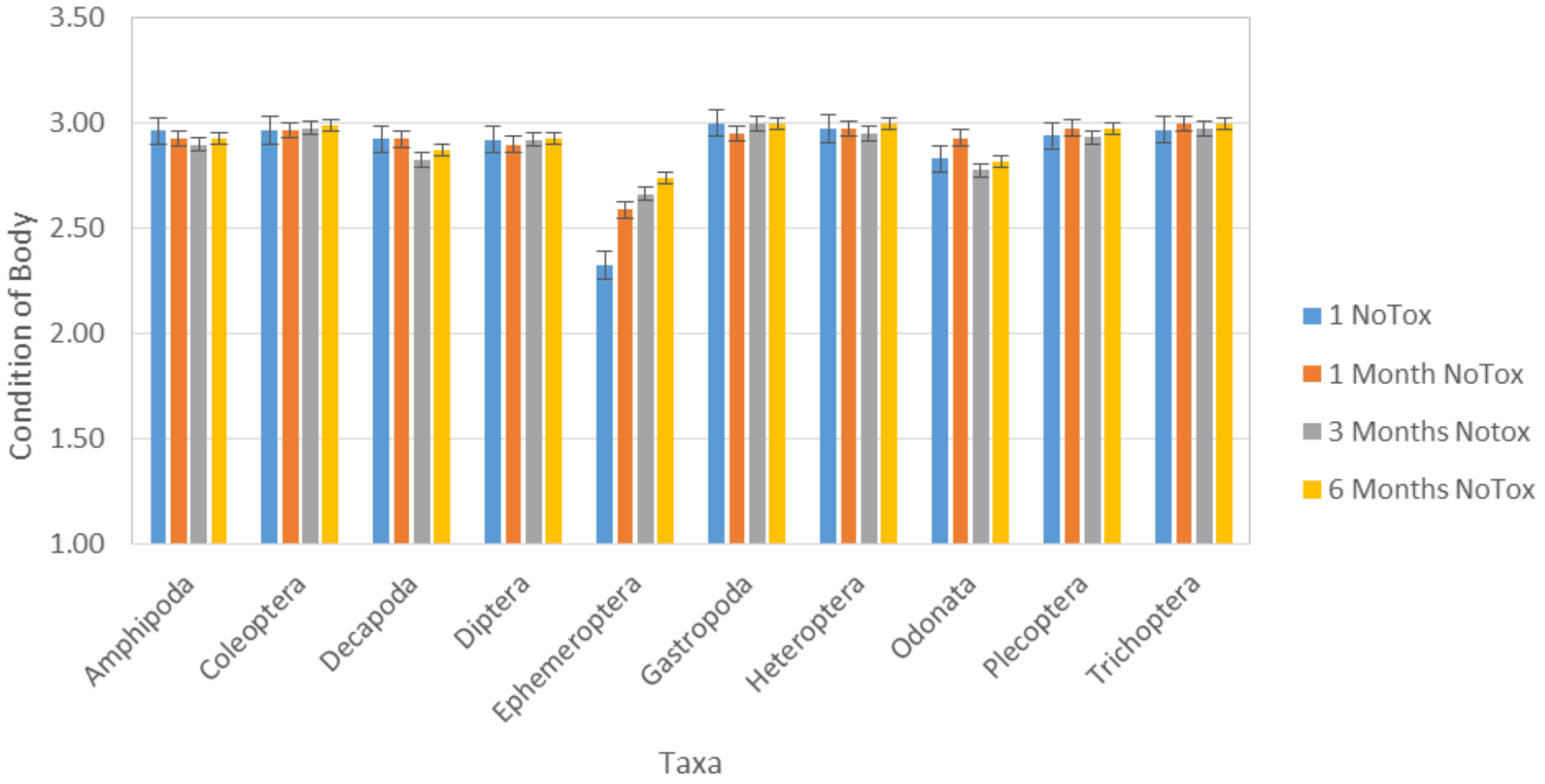
Tissue Condition Over 6 Months (NoTox)



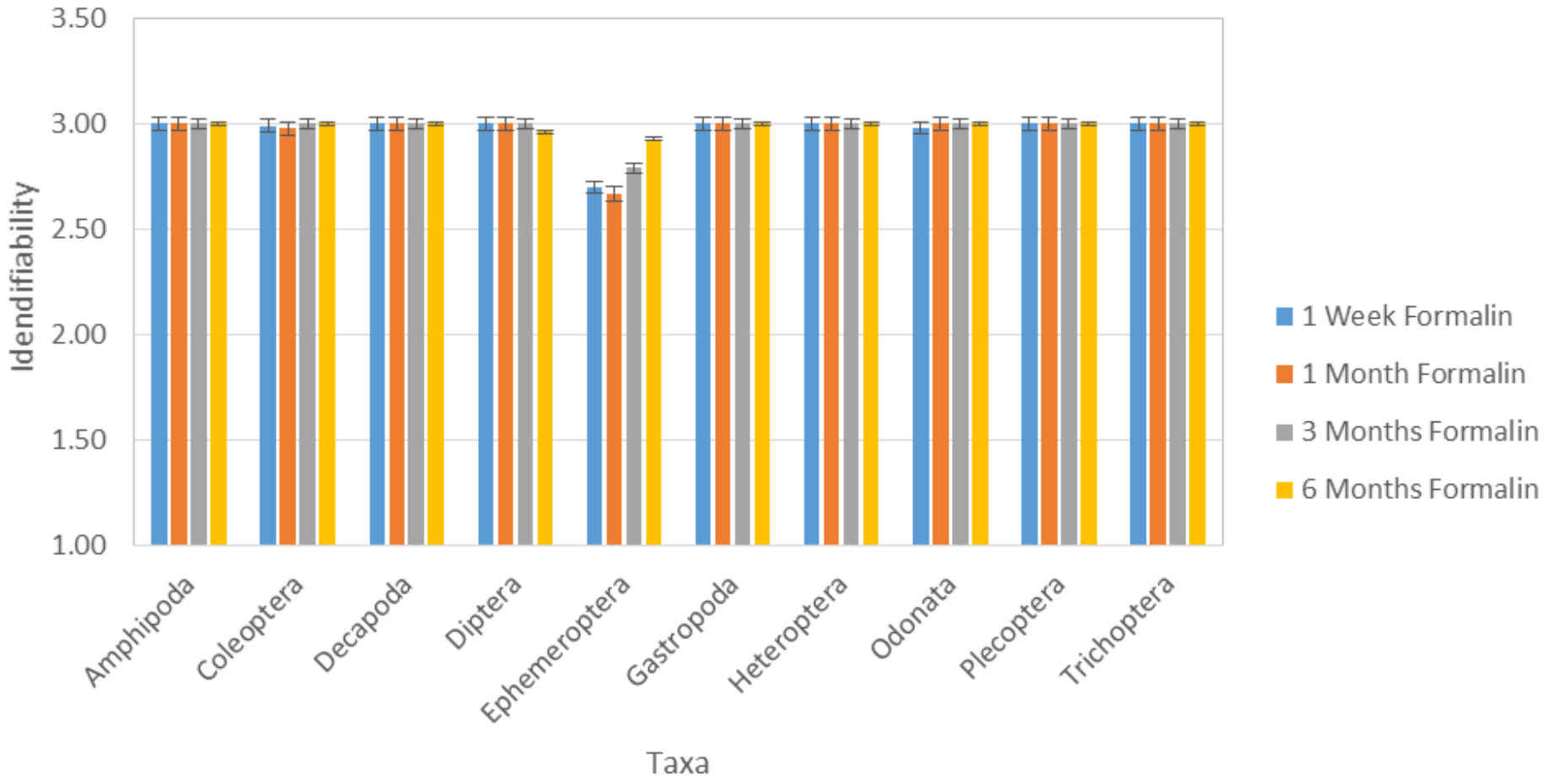
Body Condition Over 6 Months (Formalin)



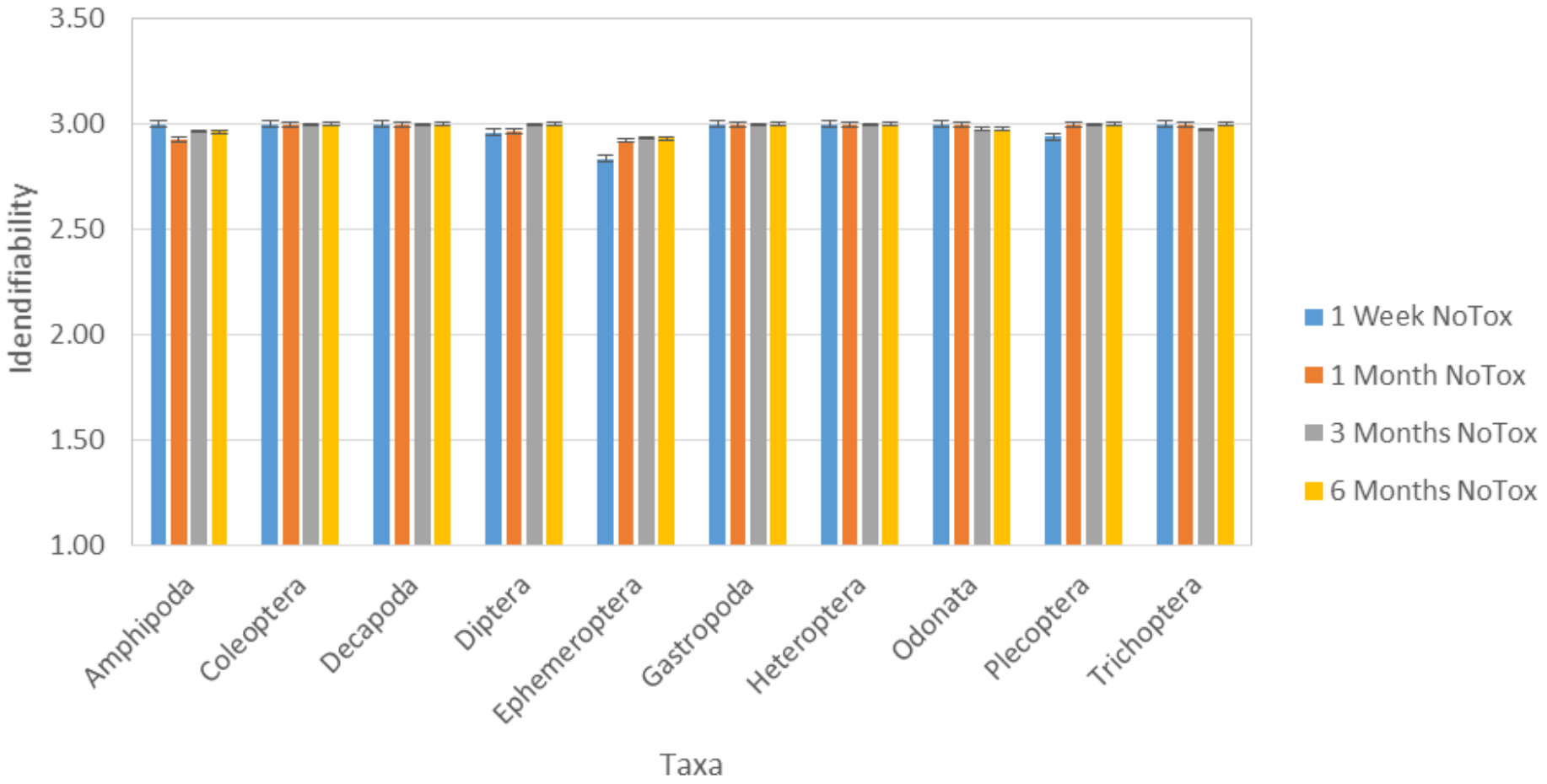
Body Condition Over 6 Months (NoTox)



Identifiability Over 6 Months (Formalin)



Identifiability Over 6 Months (NoTox)



CONCLUSIONS

- In the SCI samples, both preservatives worked well and identifiability was high. The animals in Mule Creek that were preserved in formalin were in slightly better condition, while in Yon Creek, the animals preserved in NoTox were in slightly better condition. This suggests that any advantage in condition was probably due to processing rather than the type of preservative.
- The time of preservation seemed to have minimal effect on the quality of preserved specimens in NoTox while formalin was slightly detrimental to the tissue and/or body condition of Decapoda, Diptera, Plecoptera, and Trichoptera over time.
- Identifiability was high in all taxa in both preservatives.

NOTES

- In Gastropods, long-term preservation in formalin often results in a hardening of the shell and tissues accompanied by crystallization. Or sometimes the shells dissolve. In Ampipods, the specimens often become brittle. These problematic conditions would not be expected to happen to Gastropods or Amphipods preserved in NoTox.
- NoTox is non-carcinogenic but because it is flammable, it cannot be disposed of down the drain as the manufacturer suggests; making disposal as expensive as formalin which much be disposed of as a hazardous waste. The price of NoTox is (~$55/gallon*) compared to formalin (~$8.50/gallon*). Disposal of formalin for our lab is approximately $7.25/gallon. Disposal of NoTox would most likely be comparable.

* Prices from Fisher Scientific in March, 2016.

Questions or comments?

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