

Carcinogenicity of PAH in Sediment to Benthic Fish

- **Field Studies**
- **Laboratory Studies**
- **Black River Case History**
 - **With Coke Plant Operating**
 - **After Coke Plant Closure**
 - **Post Dredging**
 - **After Recovery**

Location of Tumor Epizootics in Fish

Everett Harbor
Mukilteo
Eagle Harbor
Duwamish Waterway



Bowfin

Brown Bullhead

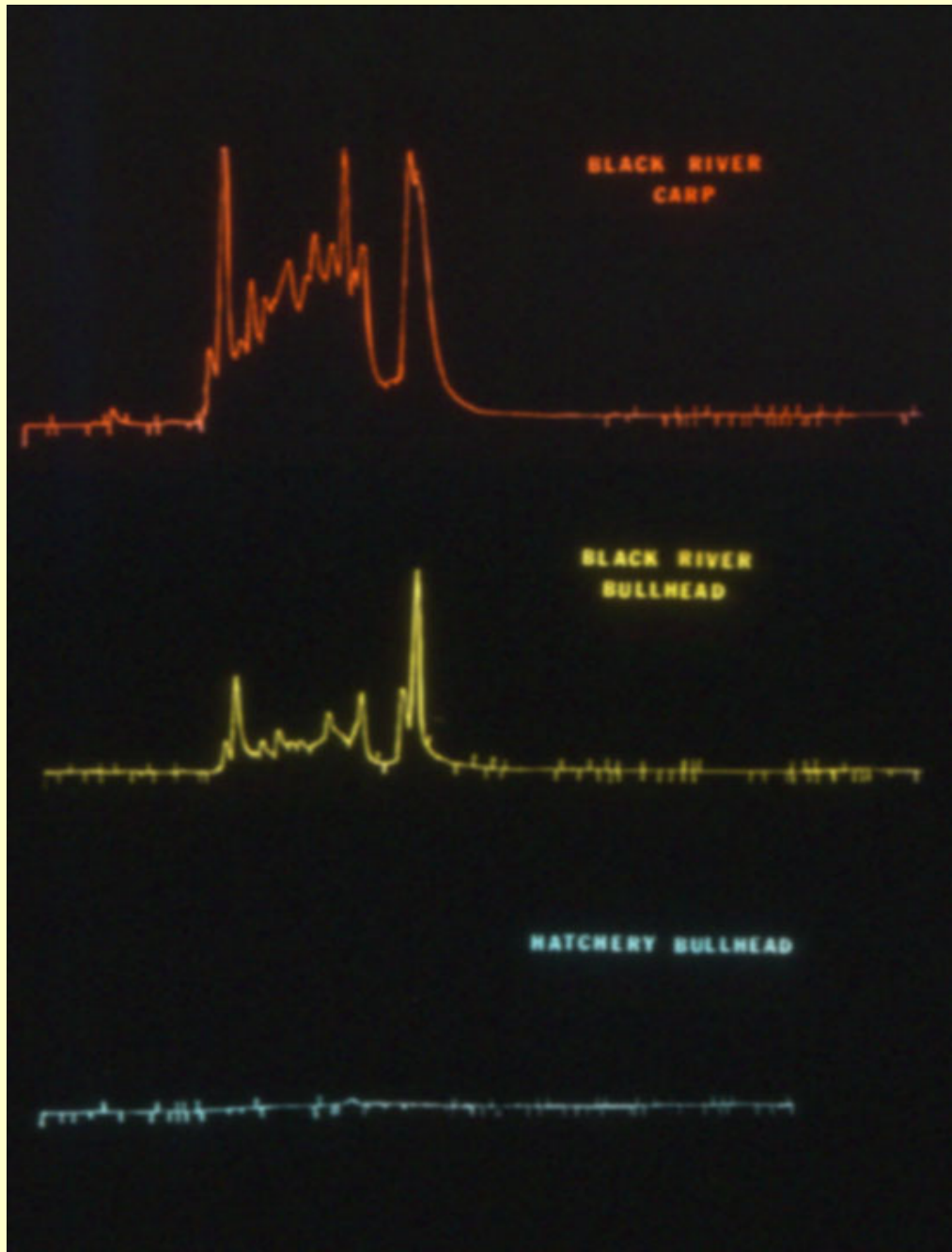
English sole

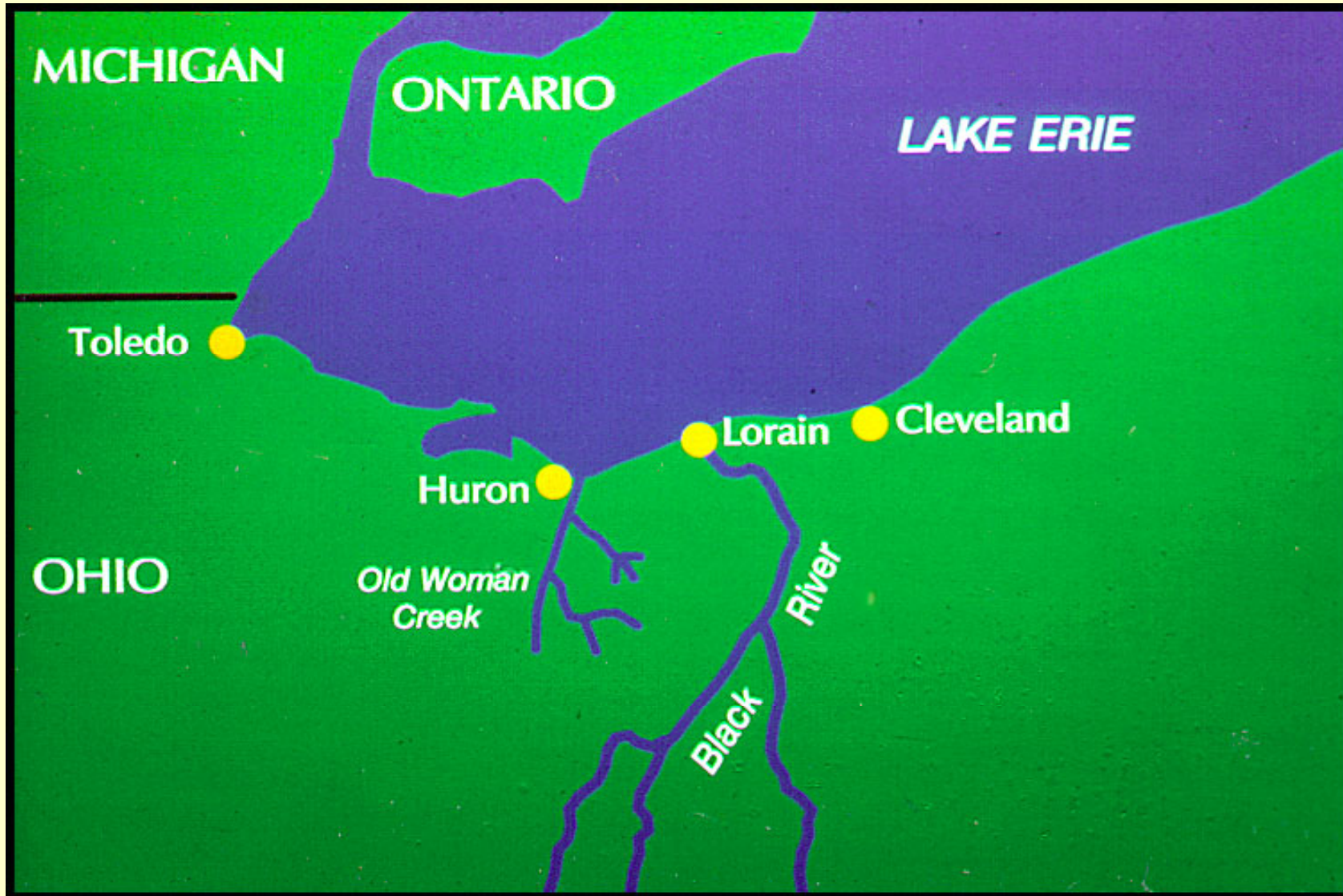
Mummichog

White sucker

Winter flounder



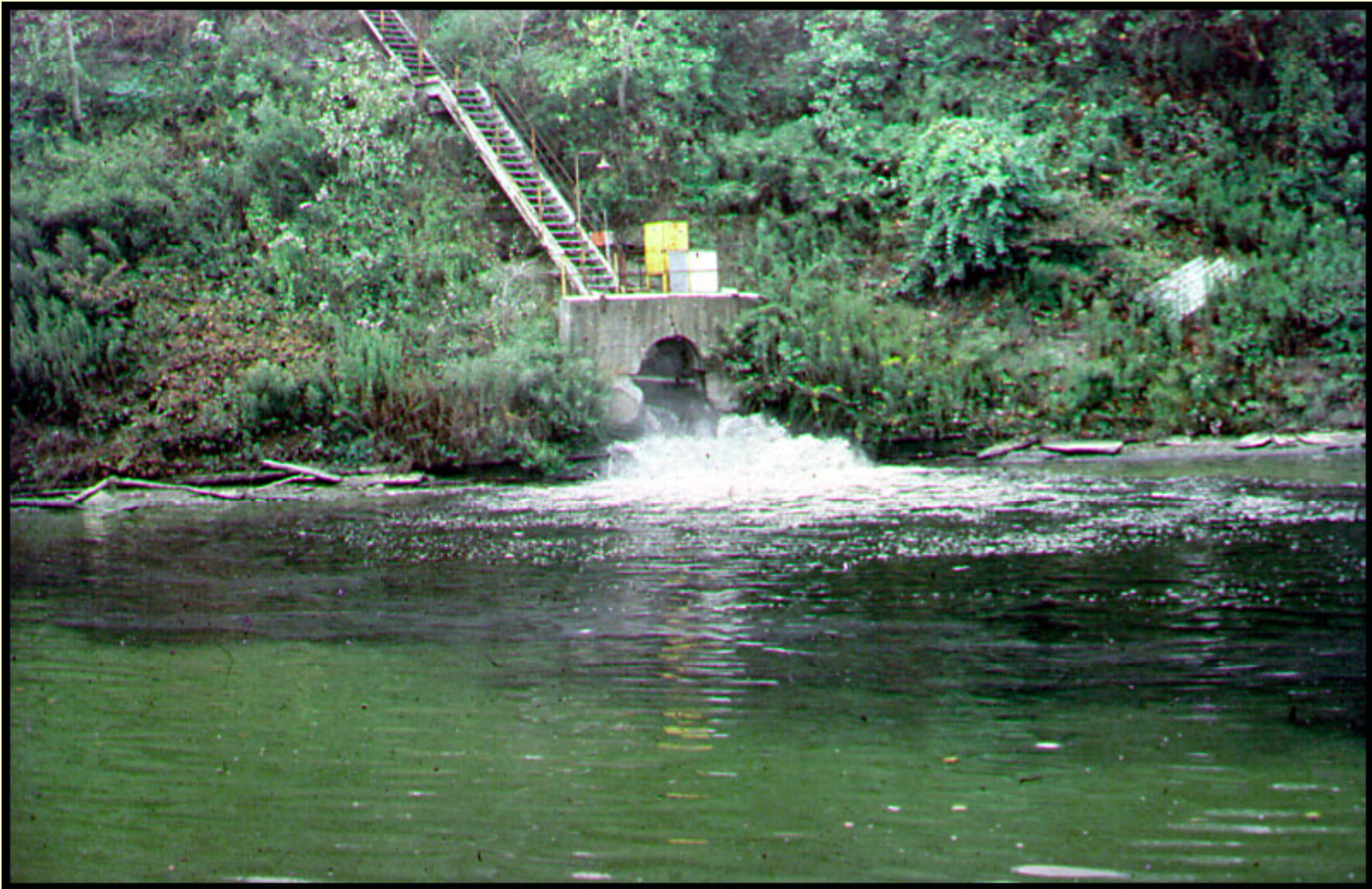




USX Facility



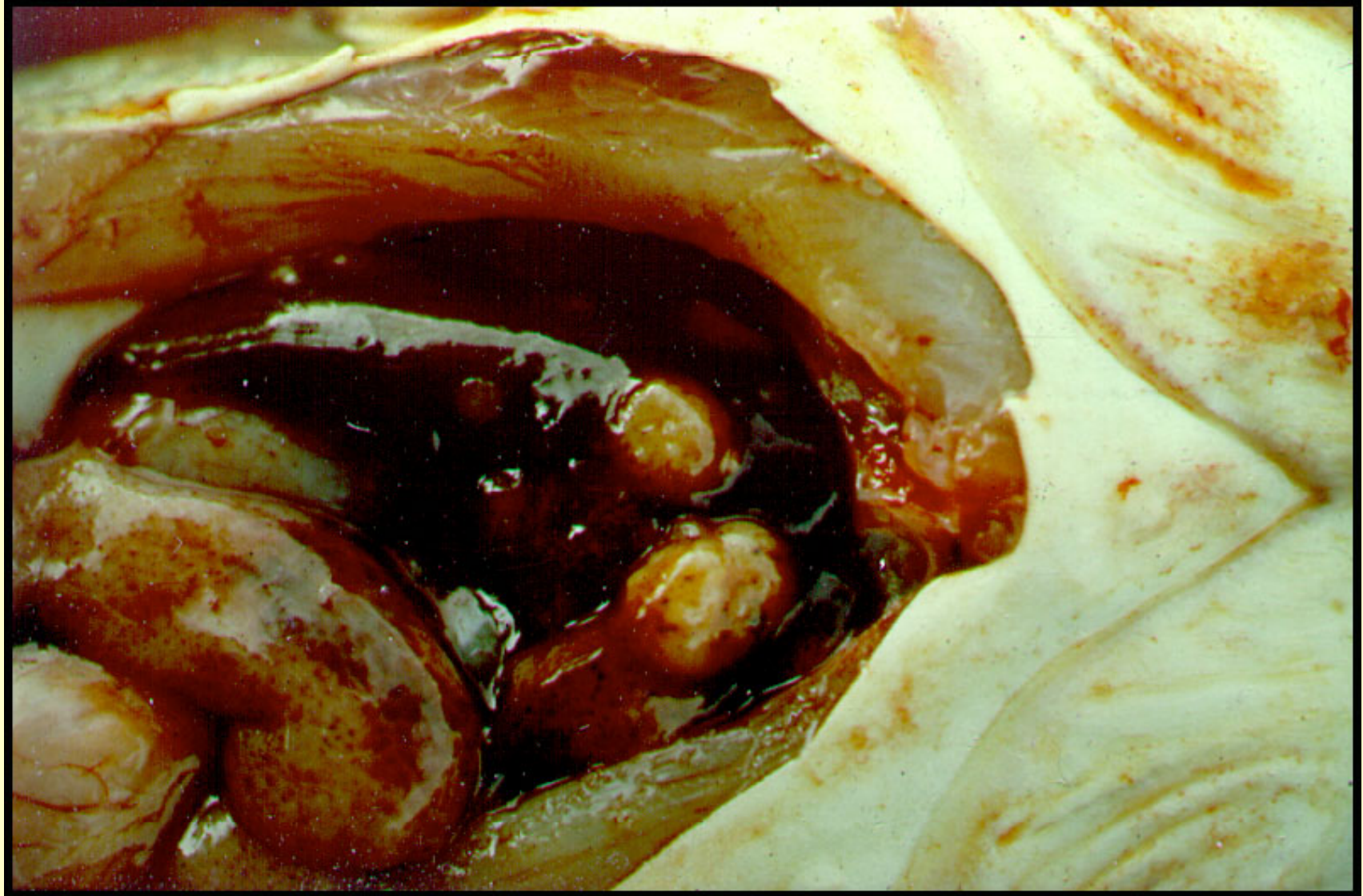
Coke Plant Outfall

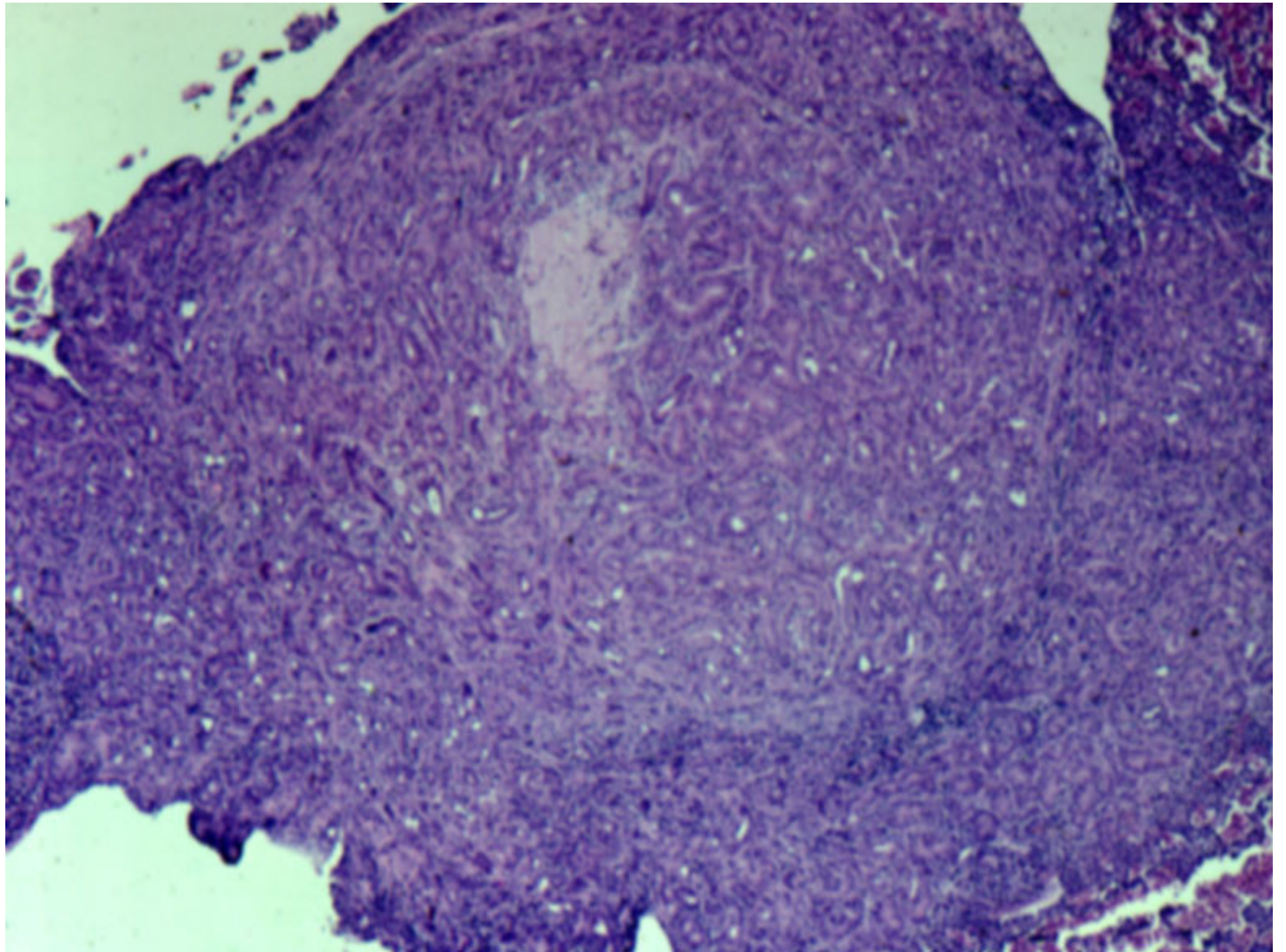


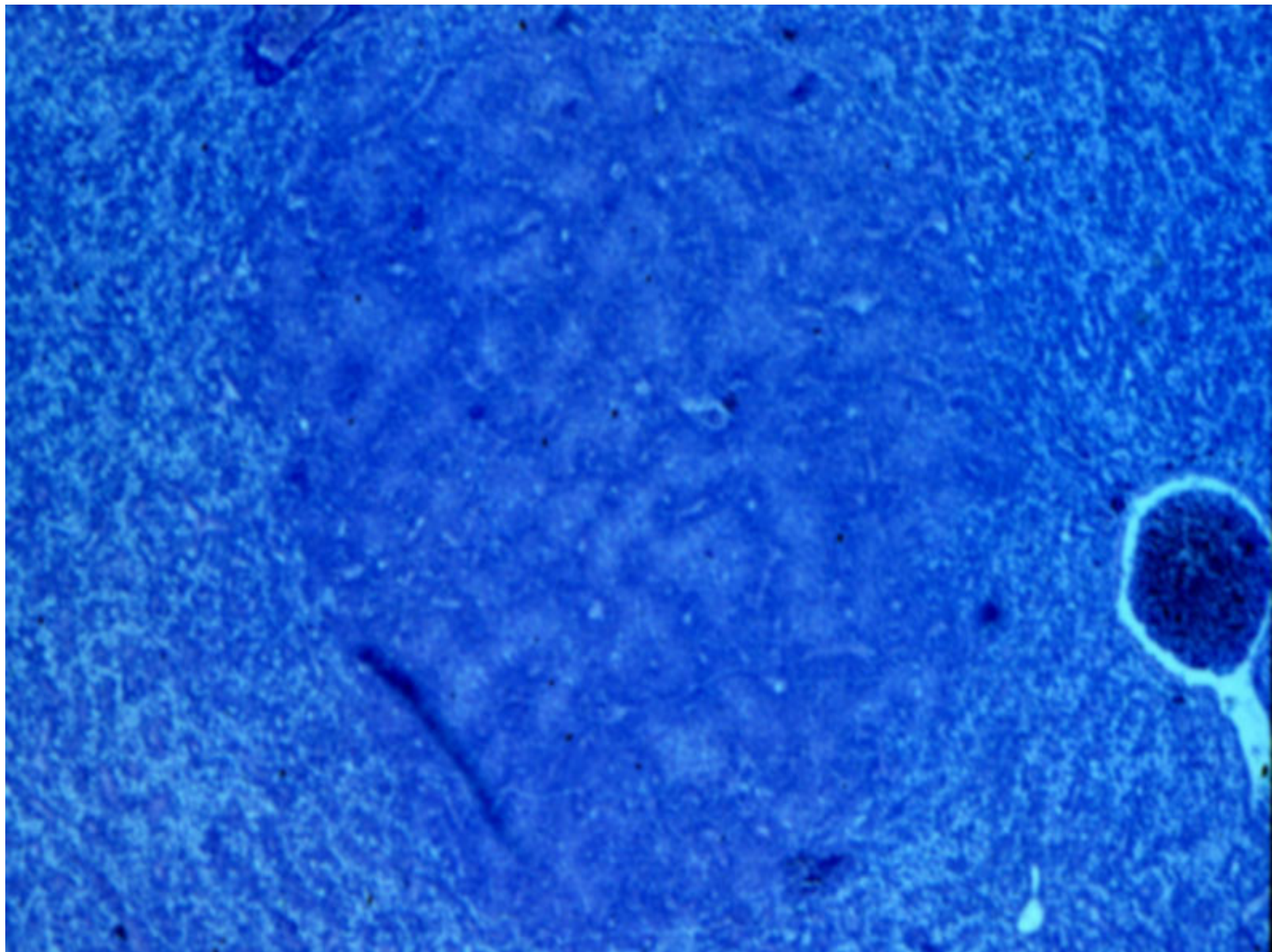
External Abnormalities



Internal Pathology



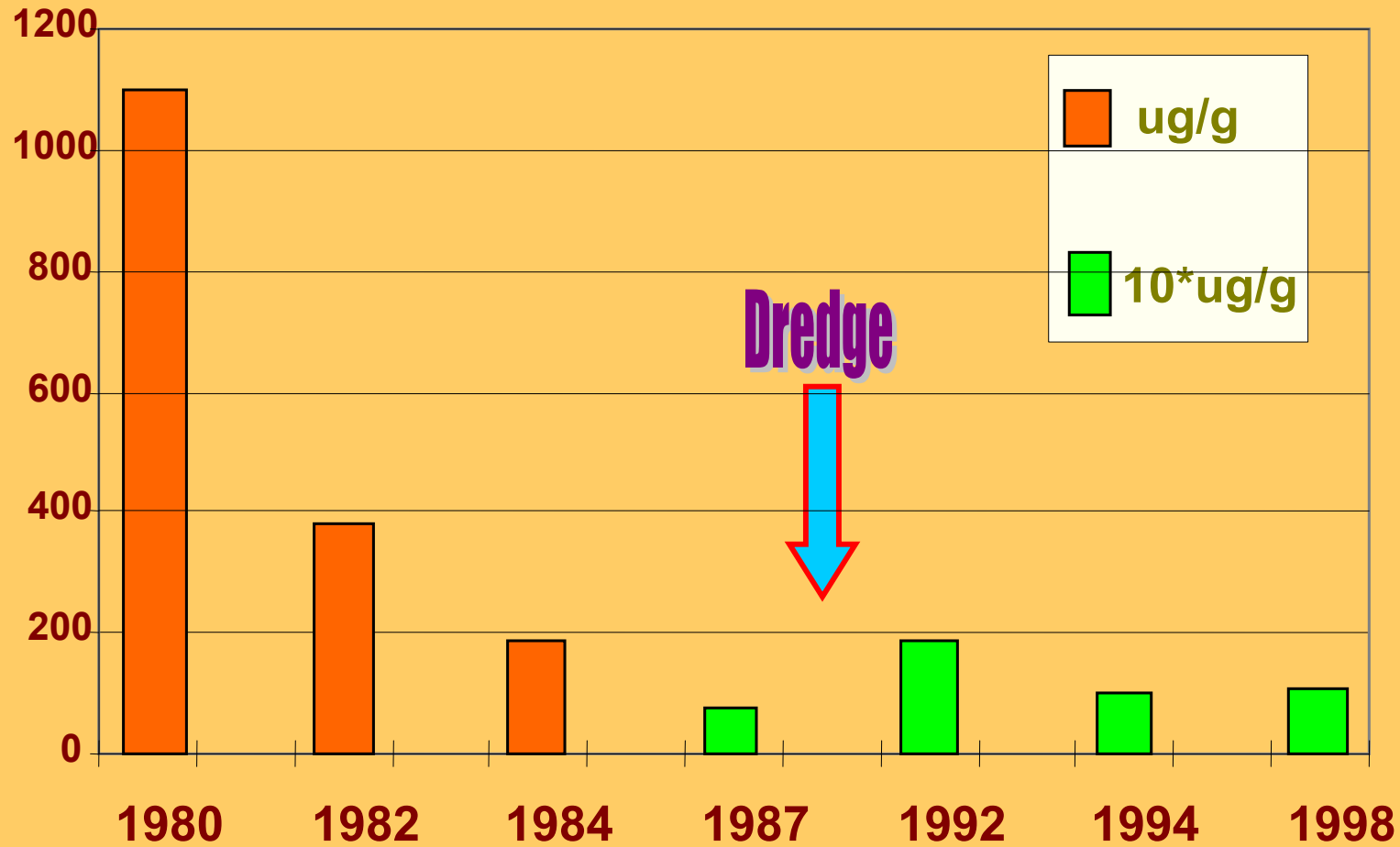




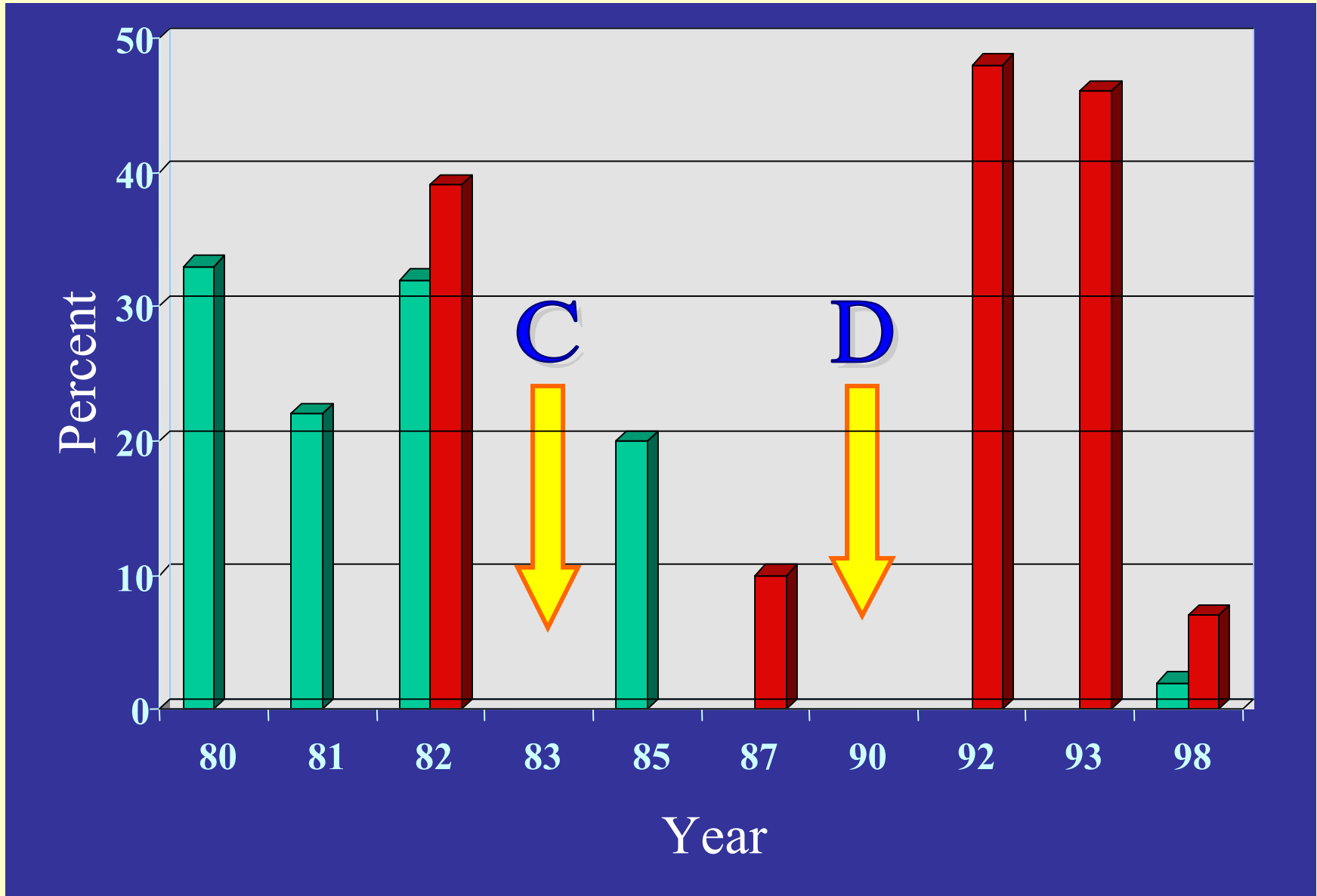
Black River Timeline



- 1980 Select
- 1981 Select
- 1982 Complete
- 1983 Coking Stops
- 1985 Select
- 1987 Complete
- 1990 Dredging
- 1992 Complete
- 1993 Complete
- 1994 Complete
- 1998 Complete

PAH (ug/g) in Black River Sediment



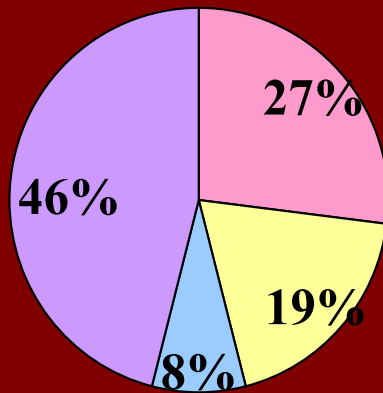
Bullhead Cancer Prevalence



 Grossly Visible Lesions  Random Histopathology

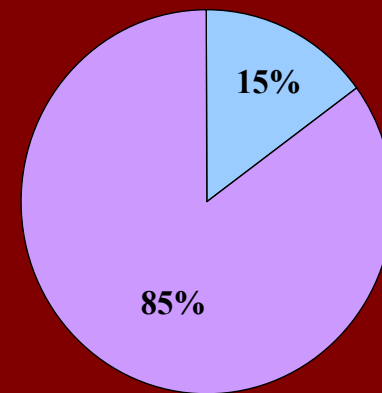
Neoplasms in Age 3 Fish

1992 N = 37



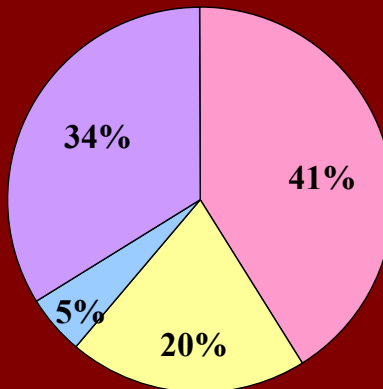
Age 1

1994 N = 27



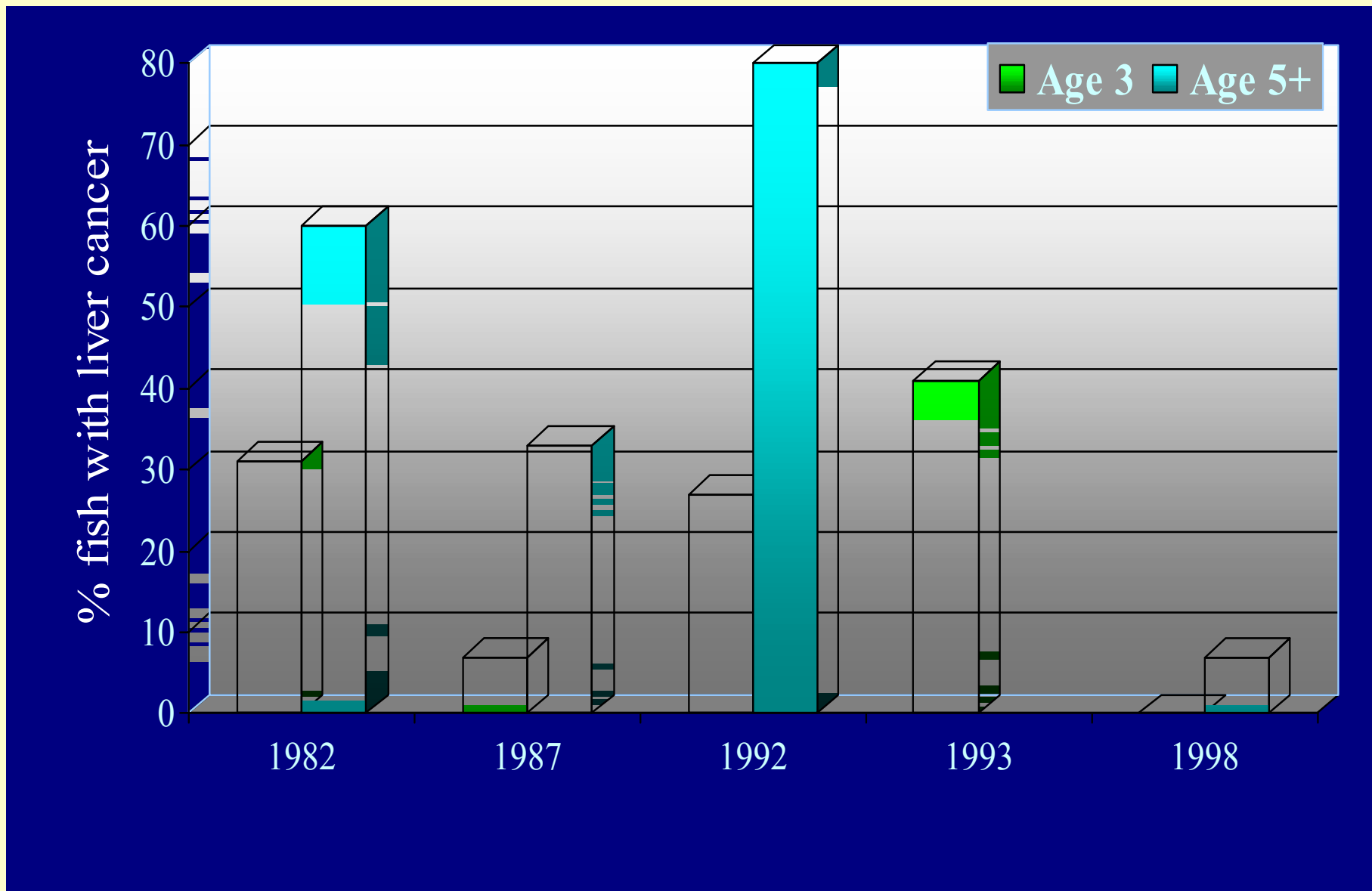
YOY 1991

1993 N = 56

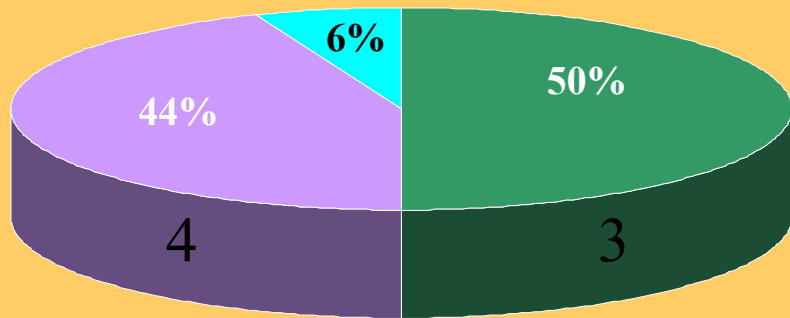


YOY

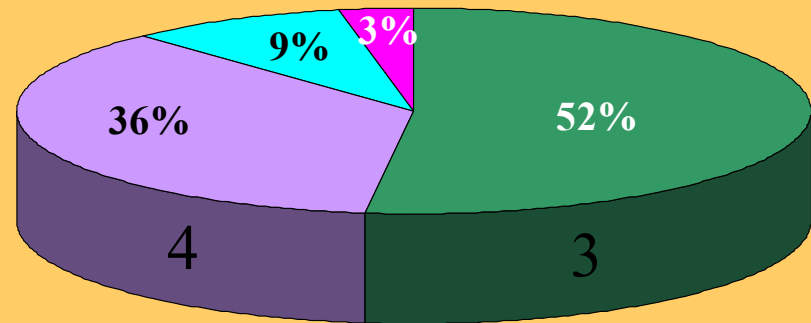
Liver Cancer of Fish Age 3 and 5+



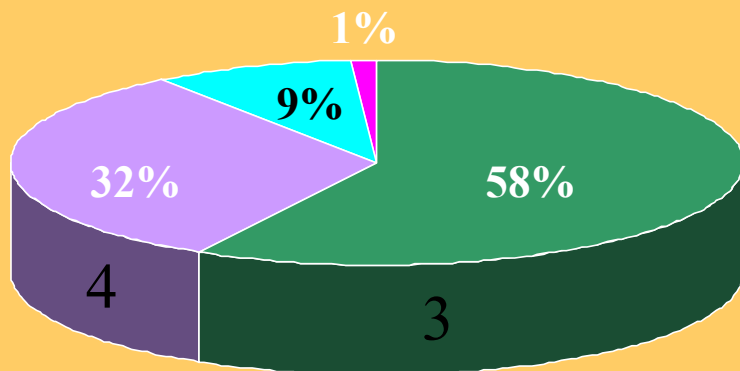
POPULATION EFFECTS



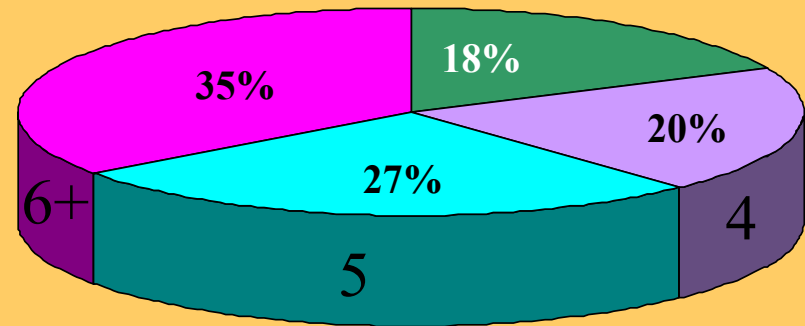
81 & 82



87



92 & 93



98