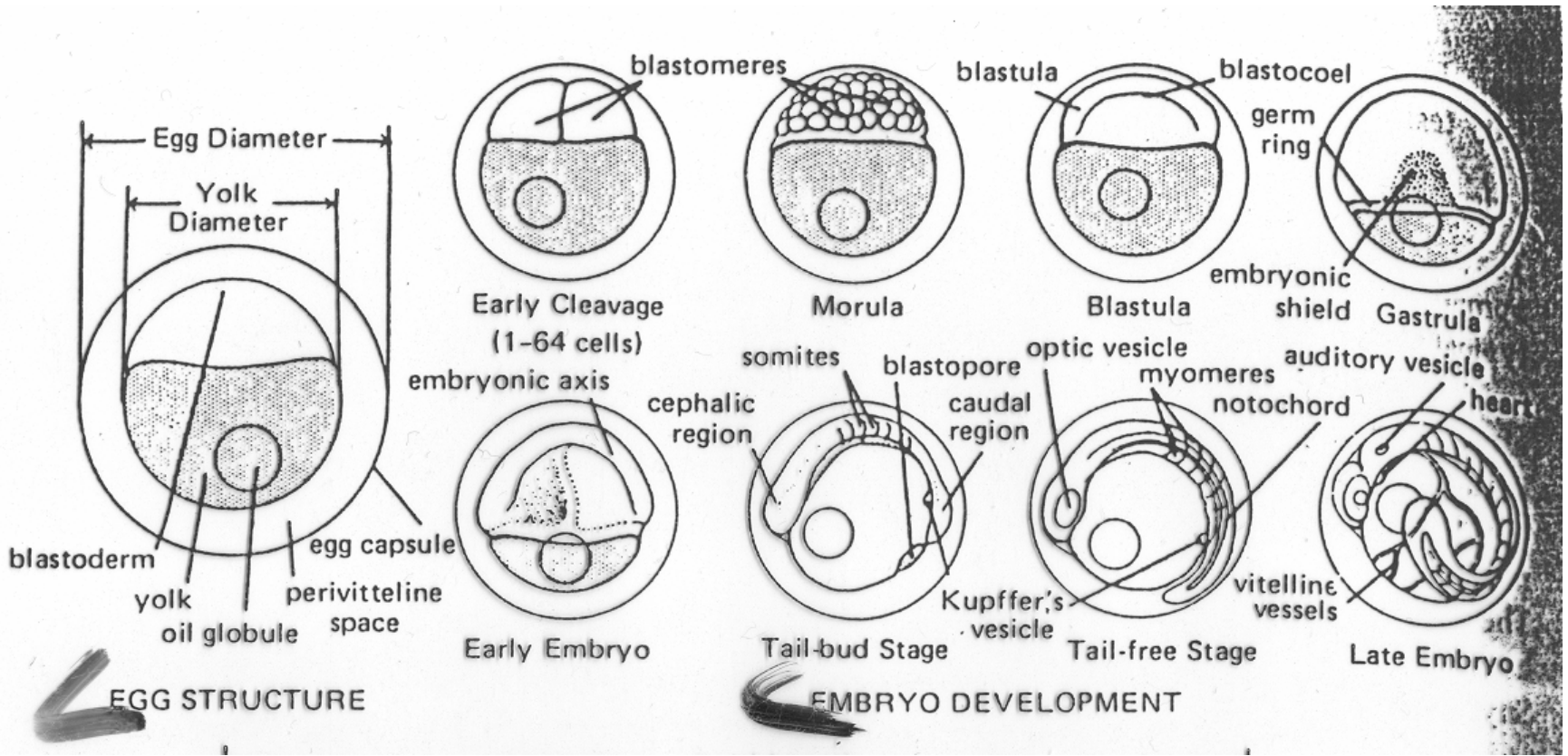
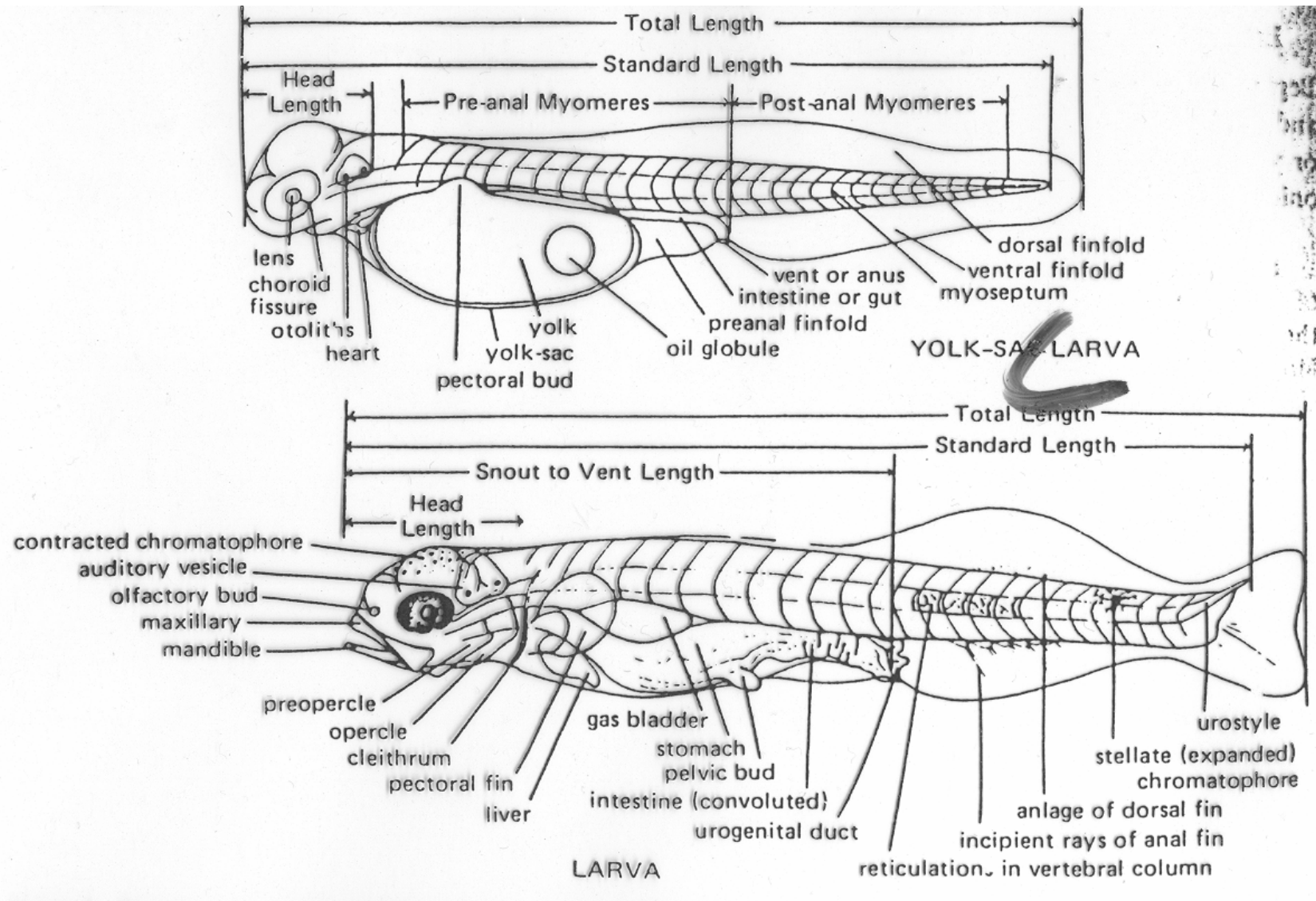


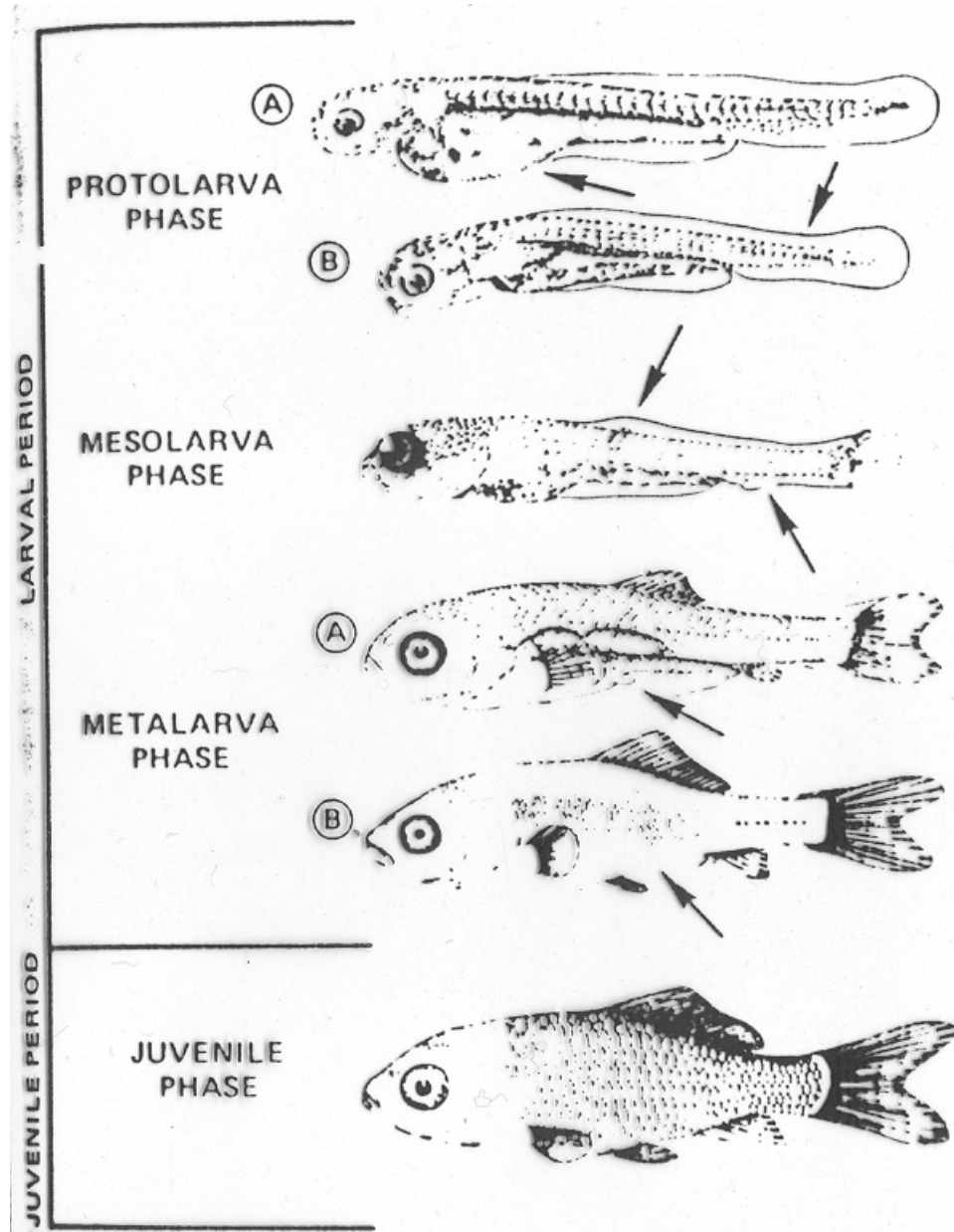
Ekotoxikologie rybích modelů

BM pro MU





Diagrammatic representation of morphology and development of embryonic and larval periods of typical teleost (modified from Jones et al. (1978))

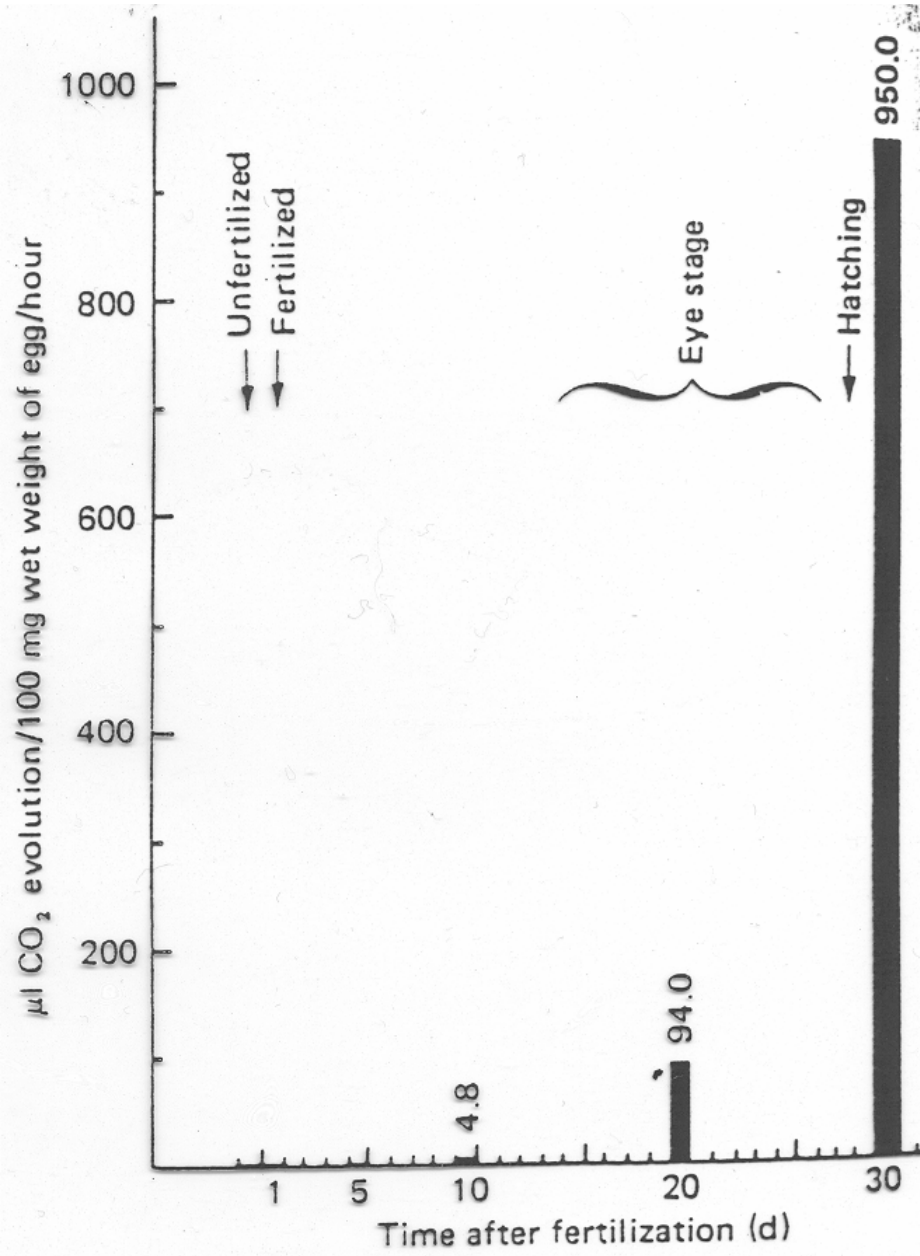


Sequence showing morphological changes separating larval fish into phases, (Drawings from Jones et al. (1978).) Protolarva: (a) Just hatched with large yolk

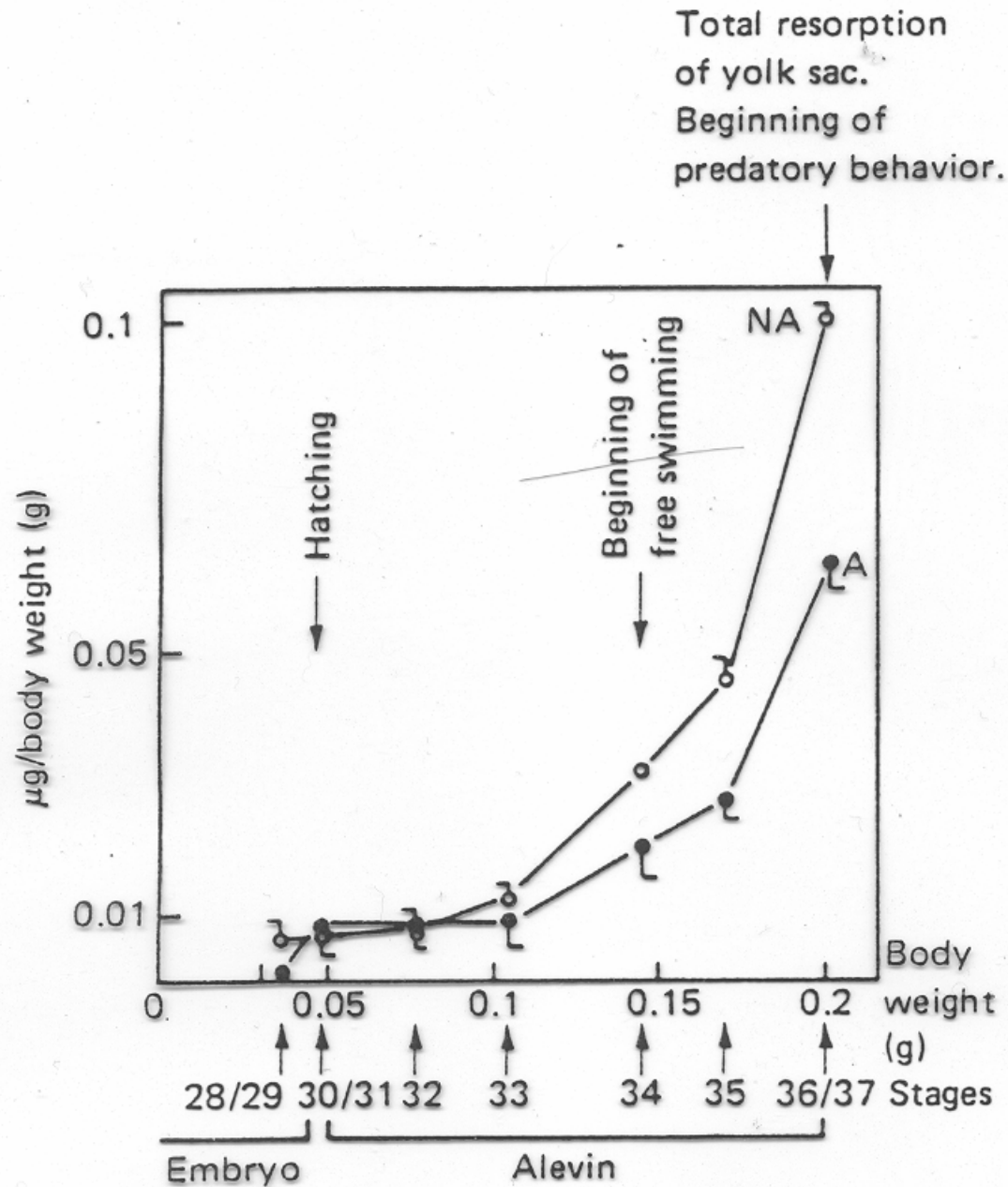
sac and complete median fin fold; (b) yolk almost gone approaching shift to exogenous food, median fin fold still complete. Mesolarva. Feeding on exogenous food and distinct fin rays apparent in median fin folds. Metalarva: (a) Rays in median fins well developed and pelvic fin bud just apparent; (b) fins well developed, but preanal median fin fold still present. Juvenile: Full complement of fins and no median fin folds remaining.

Ekotoxikologické parametry je nutno používat PROMYŠLENĚ- mění se během ontogeneze

- **Morfologické parametry** (máme definovaný materiál??? Stáří, pohlaví, genotyp....)
 - Délka
 - Hmotnost
 - Vývoj orgánů
 - Malformace, atd.
- **Behaviární – chování jedinců a populací**
 - Rychlost, směr, plynulost plavání
 - Chování v hejně
 - Lovná aktivita, příjem potravy
 - Rozmnožovací aktivita,... „odchytky od normálu“
- **Biochemické parametry**
 - Vysoce citlivé
 - Nedostatek srovnávacích dat- ...co je normál, kontrola??
 - Variabilita v populaci a v průběhu ontogeneze

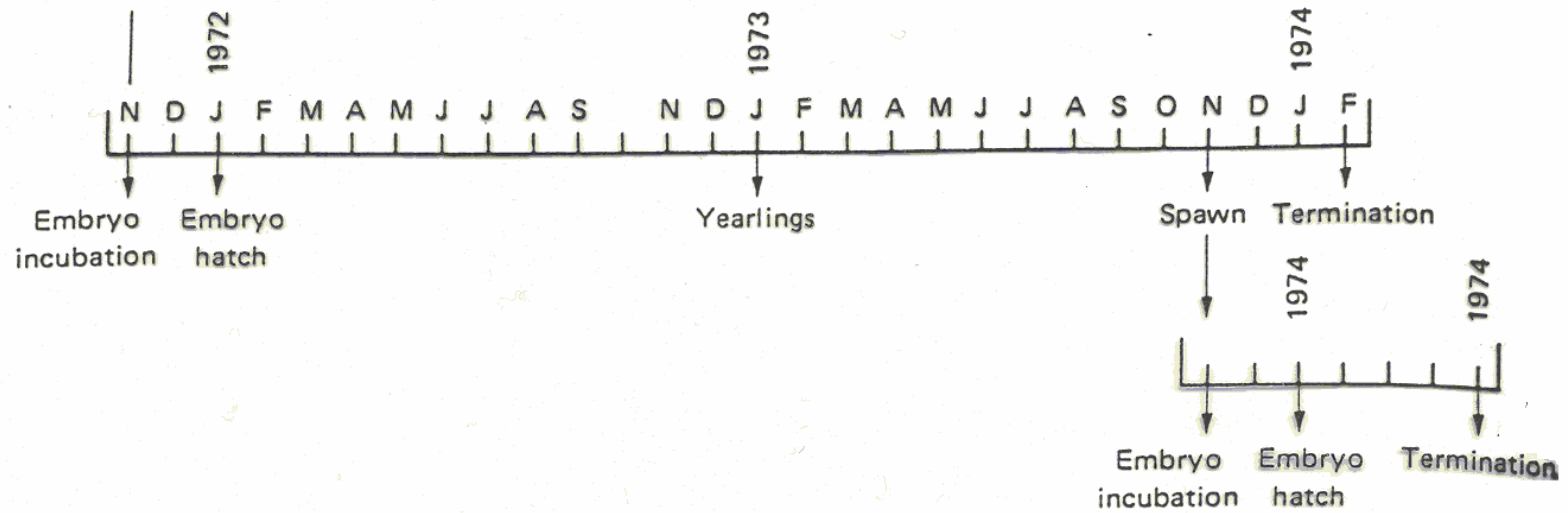


Acetylcholinesterase activity of rainbow trout embryo homogenate during development. Activity is expressed as microliters of CO_2 dissolved per 100 mg of egg (wet weight) per hour.

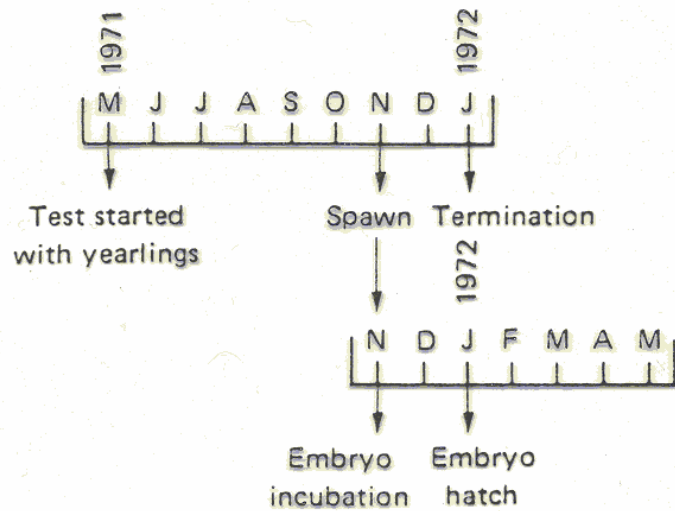


Adrenalin (A) and noradrenalin (NA) contents in embryos and larvae of rainbow trout in relation to body weight (wet).

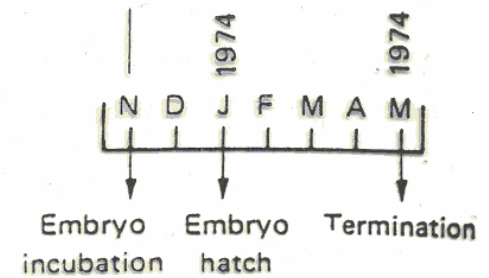
Each point represents the average for 6-12 animals.



(a)

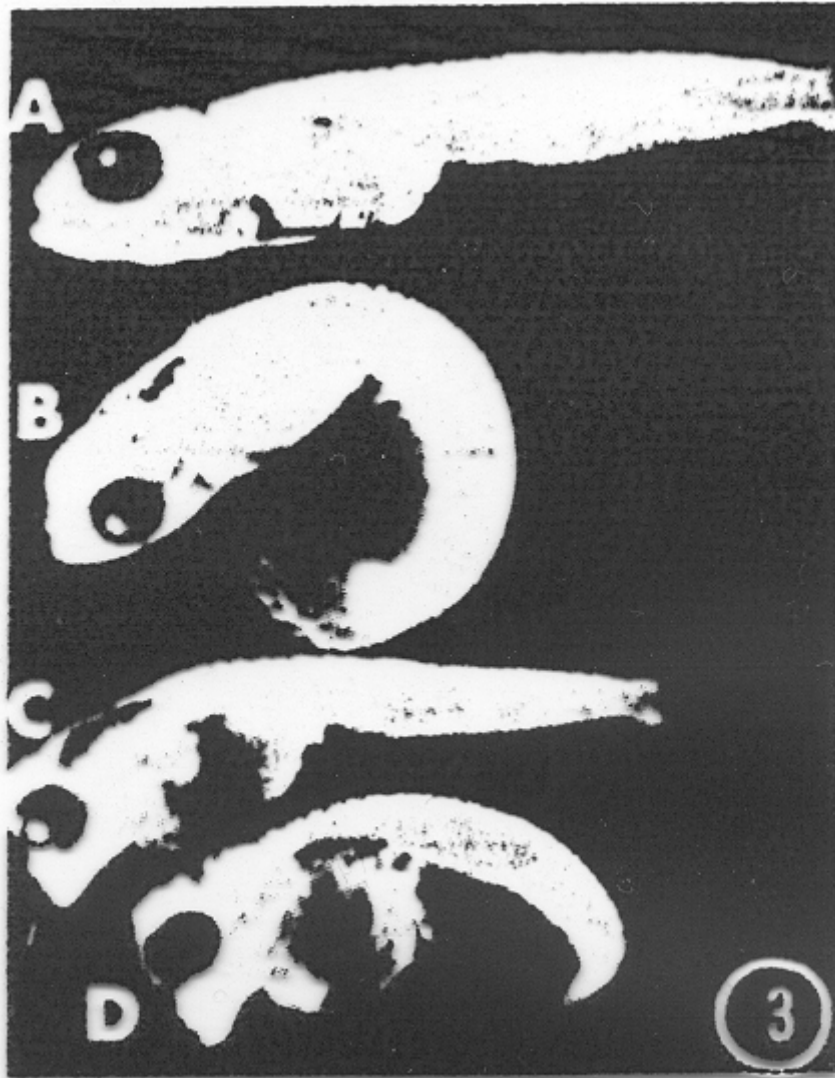


(b)



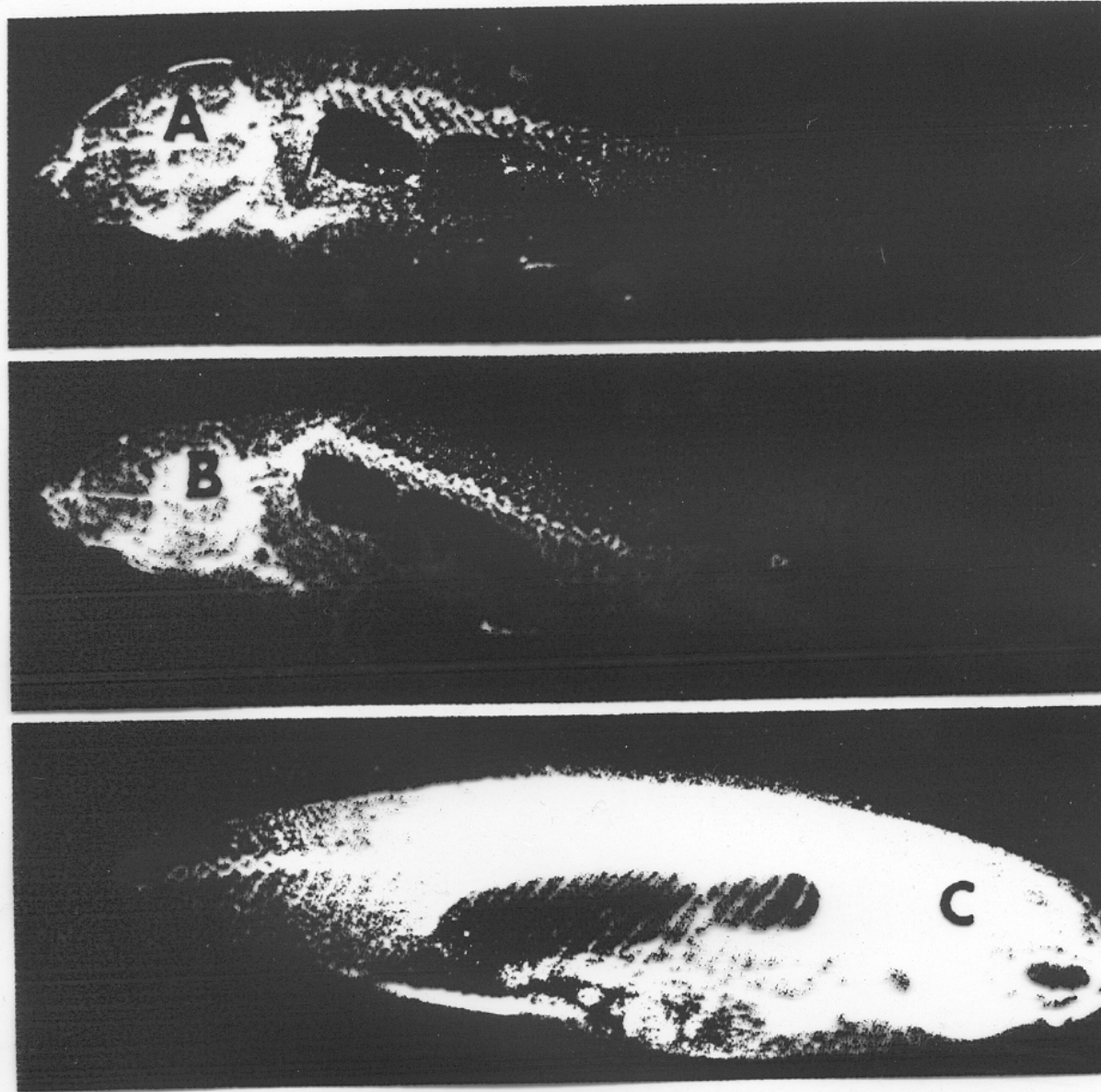
(c)

Figure 1 Chronology for (a) brook trout life cycle toxicity test; (b) partial life cycle toxicity test; and (c) early life stage (ELS) toxicity test. [Modified from Holcombe et al. (1979)]



**One-day posthatch larval
Fundulus**, approximately X 13.

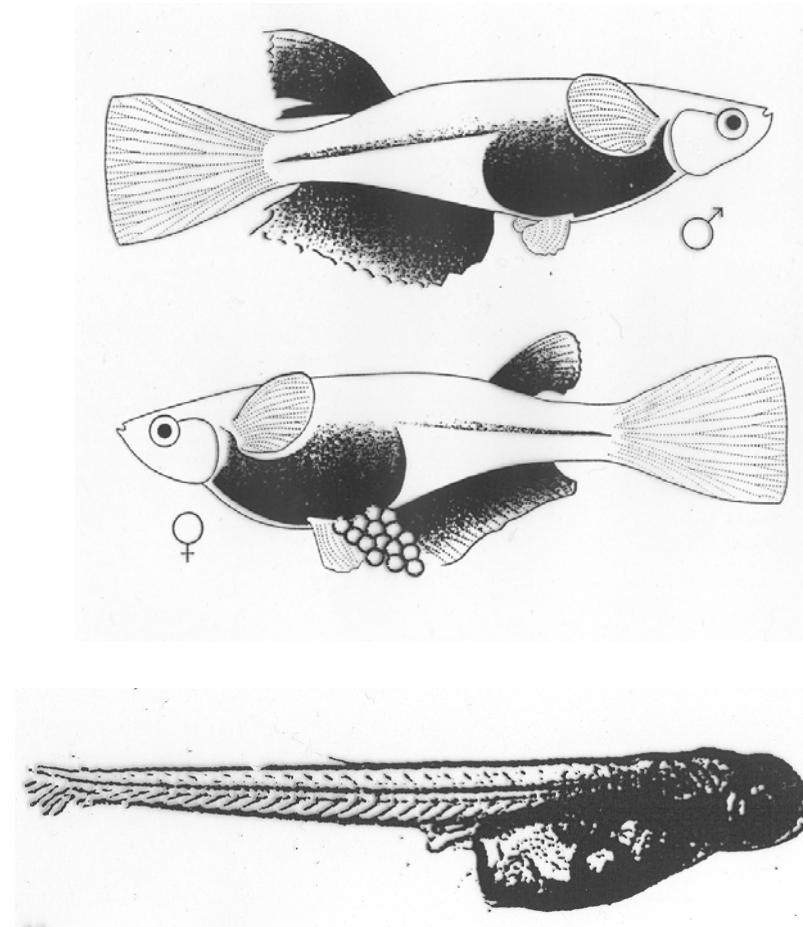
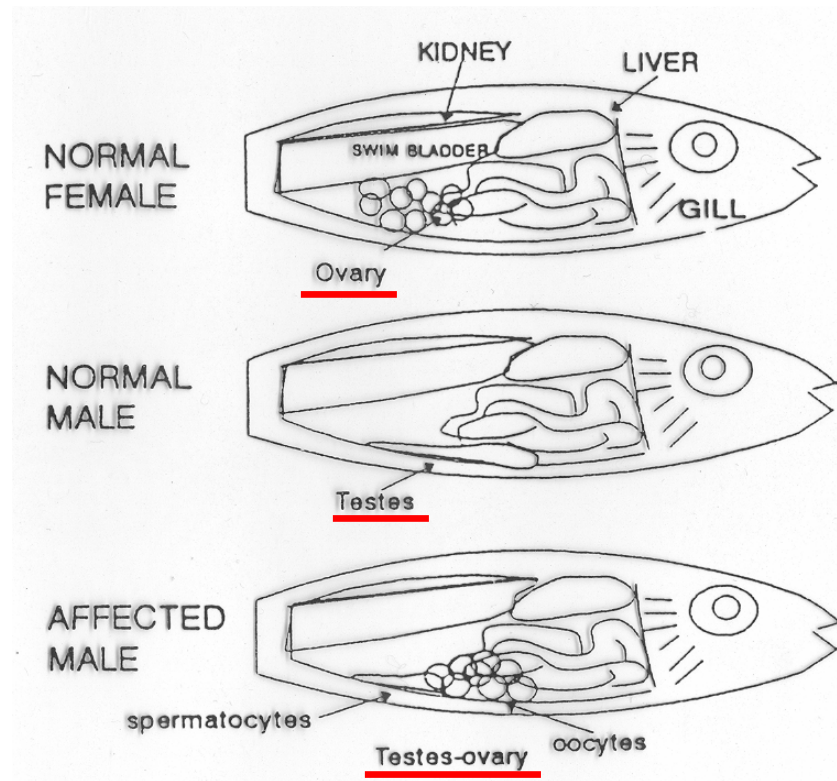
(a) Control; (b-d) treated with 0.02 mg/l methyl mercury in ovo, showing that inability to uncurl after hatching (b and d) can occur independently of craniofacial anomalies (c and d). (Modified from Weis and Weis (1997).)



**Effects of
toxaphene on
structure of
fathead minnow
backbones.**

(a and b) Radio
graphs
representative of
fish exposed to 55
ng/l toxaphene; (c)
control fish. Arrows
point to areas of
backbone affected.

Endocrine linked gonadal responses in Japanese Medaka



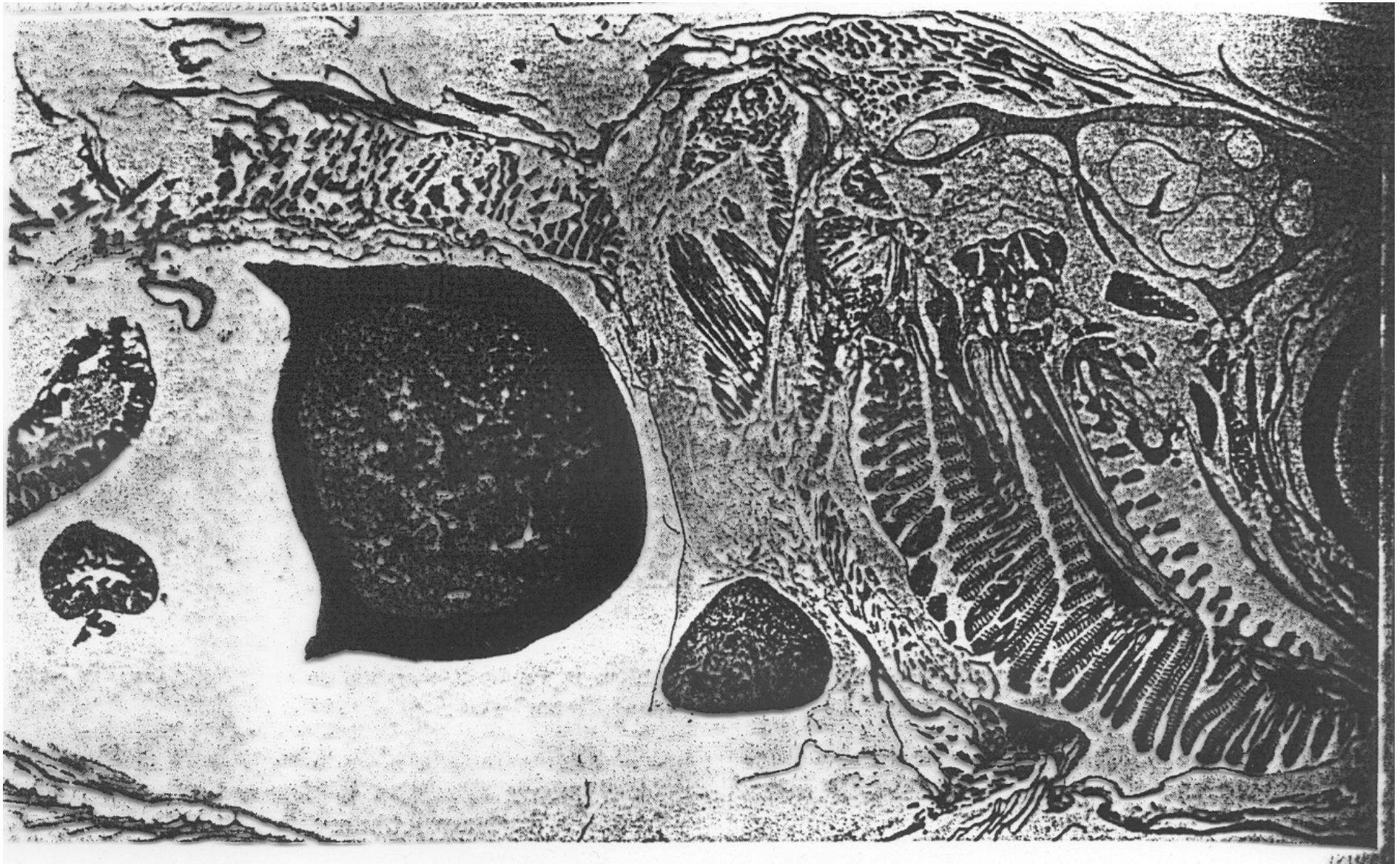
Stage 36

Right lateral view x25

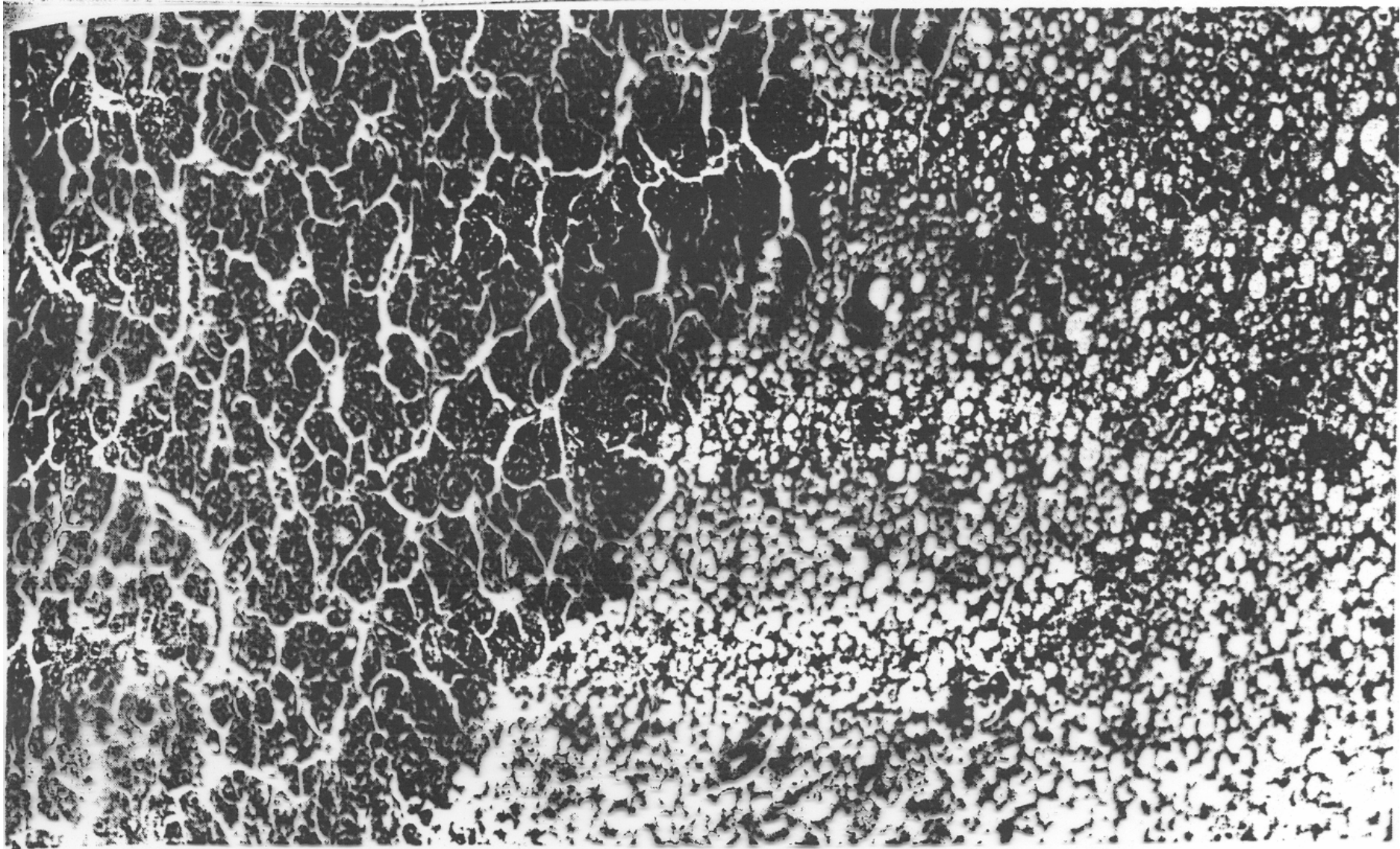
Table 4. Some chemical compounds used in initiation and promotion tests

Tissue or organ	Initiators	Promoters
Skin	Dimethylbenzanthracene Benzo[a]pyrene	Physical wounding
		Oleic acid
Urinary bladder	Methylnitrosourea	Croton oil (phorbol esters)
		Phenobarbital
		Physical wounding
Liver	2-Acetylaminofluorene	Saccharin
		Cyclamates
		DDT
		Polychlorinated biphenyls
		2,3,7,8-Tetrachlorodibenzo-p-dioxin
		Some contraceptive steroids
		Choline-deficient diet
Other	Dimethylnitrosamine N-Methyl-N'-nitro-N-nitrosoguanidine	Peroxisome proliferators
		Dietary fat (mammary gland and intestine)
		Various hormones (mammary gland)
		Tobacco use (respiratory tract)

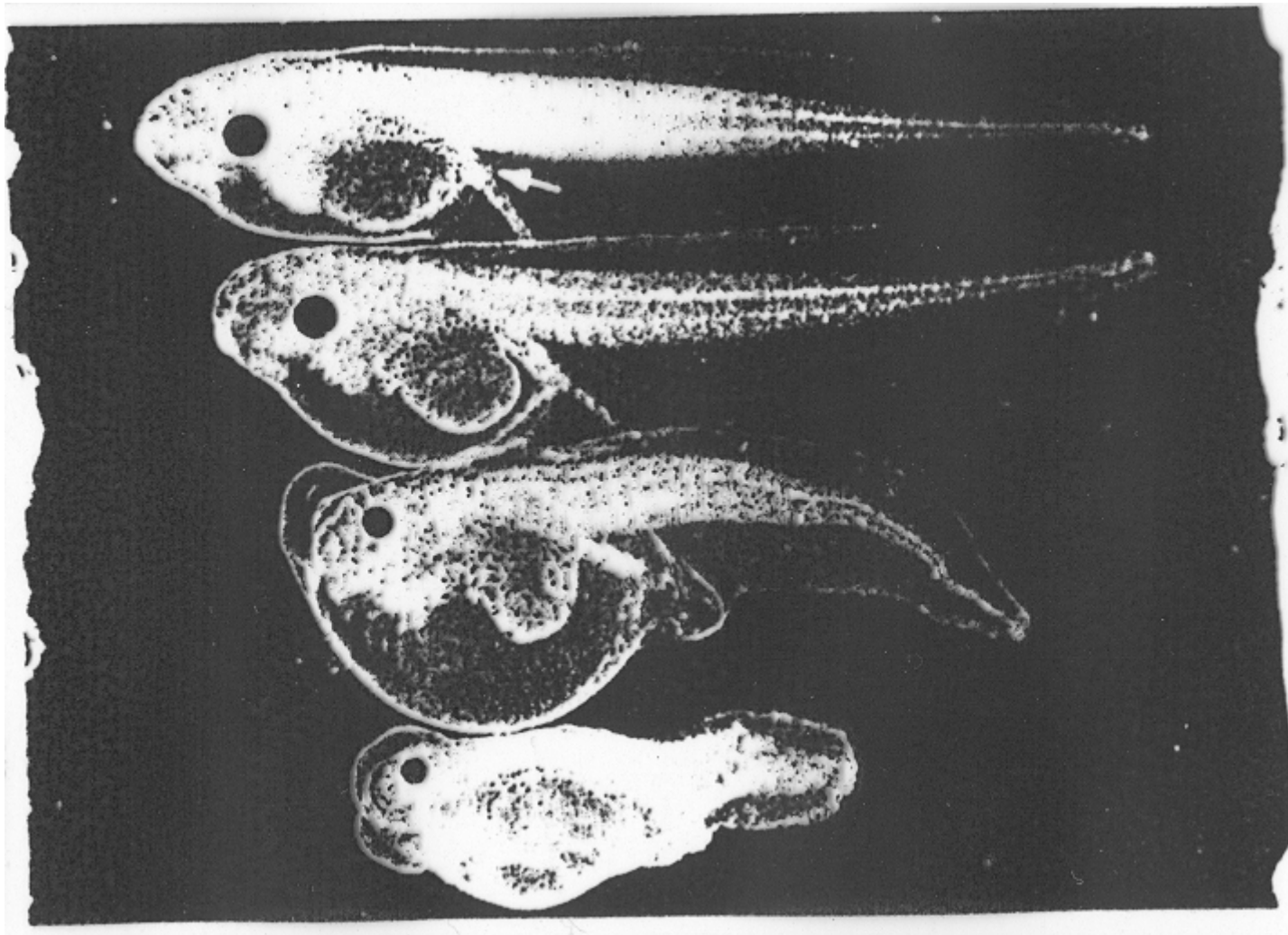
Source: Peraino and Jones, 1989.



Hepatocellular carcinoma in center of liver from medaka exposed to 10mg/L diethylnitrosane and sampled at 6th month.



Well-differentiated **hepatocellular carcinoma**. Note uniformity of cells in carcinoma and evenness of border between lesion and normal liver. From a **guppy exposed to acetylaminofluorene** and sampled at 24 mo.



Increasing concentrations of a developmental toxicant. The effects of **increasing concentration of the teratogen hydroxyurea**. Note that as the concentration increases, the malformations become more severe. Concentrations from top to bottom are control, 0.2, 0.4, and 0.7 mg/ml. (Photo by M. A. Hull.)