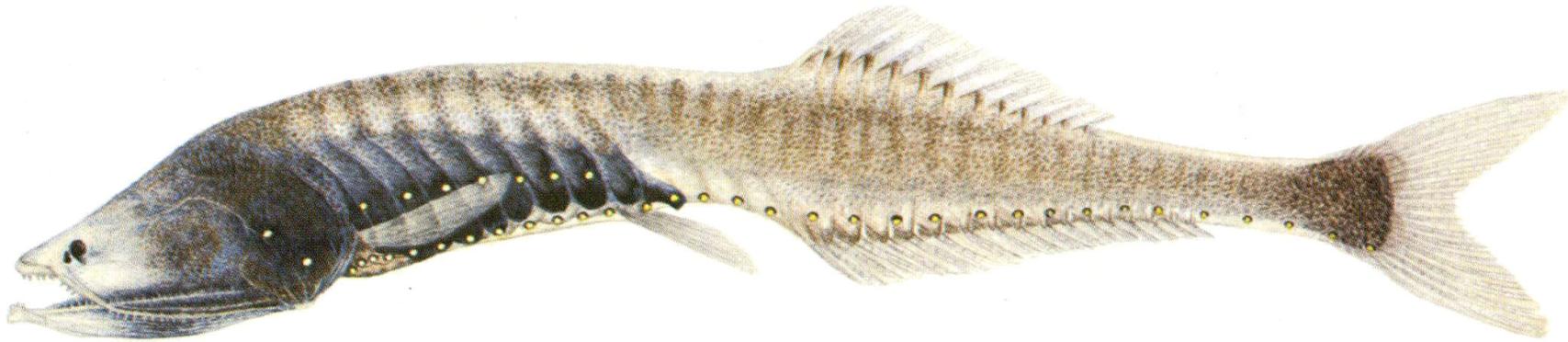


# オニハダカ属 (ワニトカゲギス目 ヨコエソ科)

Genus *Cyclothone*

現在13種を含む



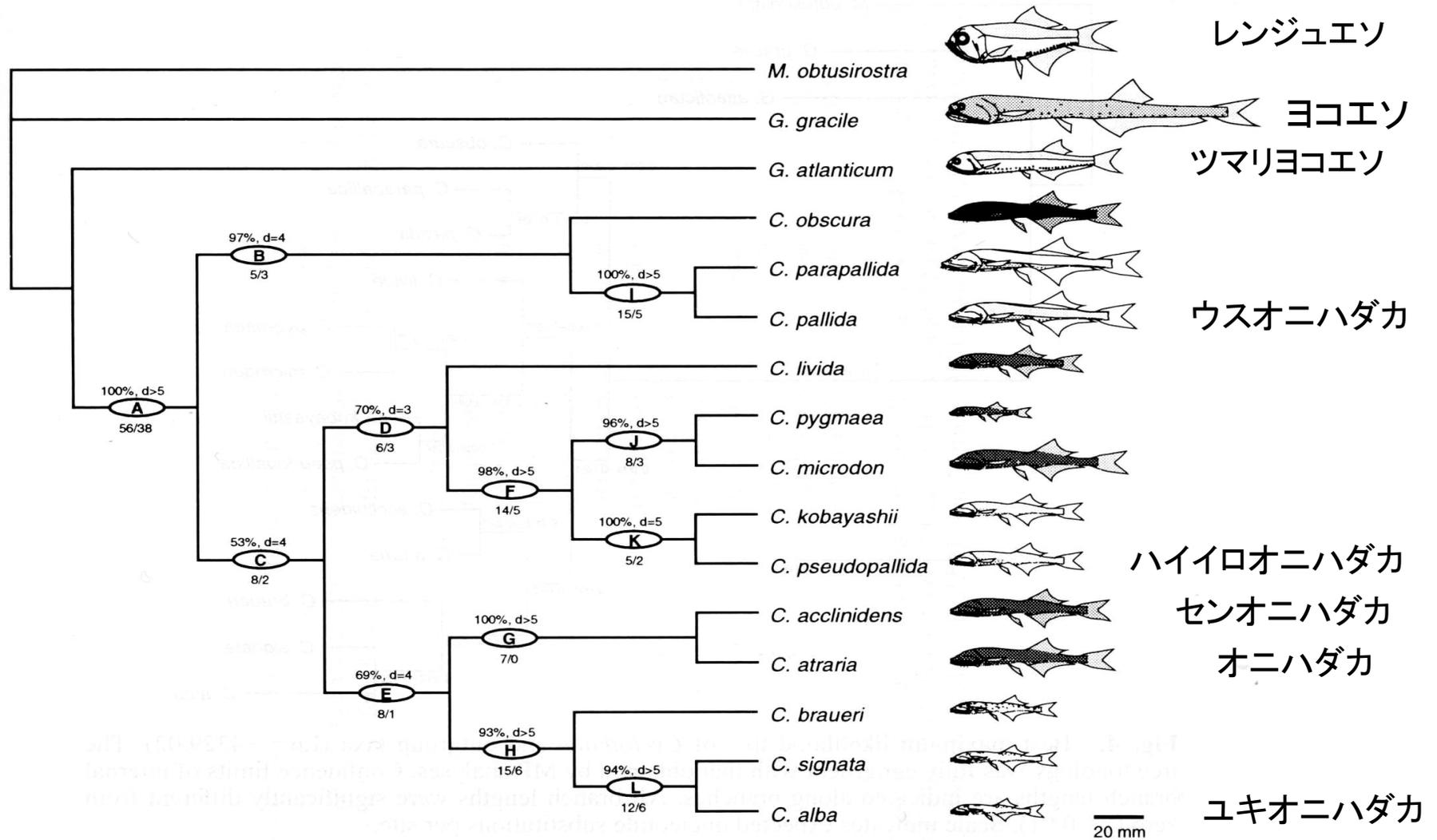
A stomioid fish of the genus *Cyclothone*, the most widely and deeply represented of all deep-sea fish genera. Note the small eyes and light organs. Length about 6 cm.

Marshall (1979) より

体長 25~75 mm の小型の中深層性魚類

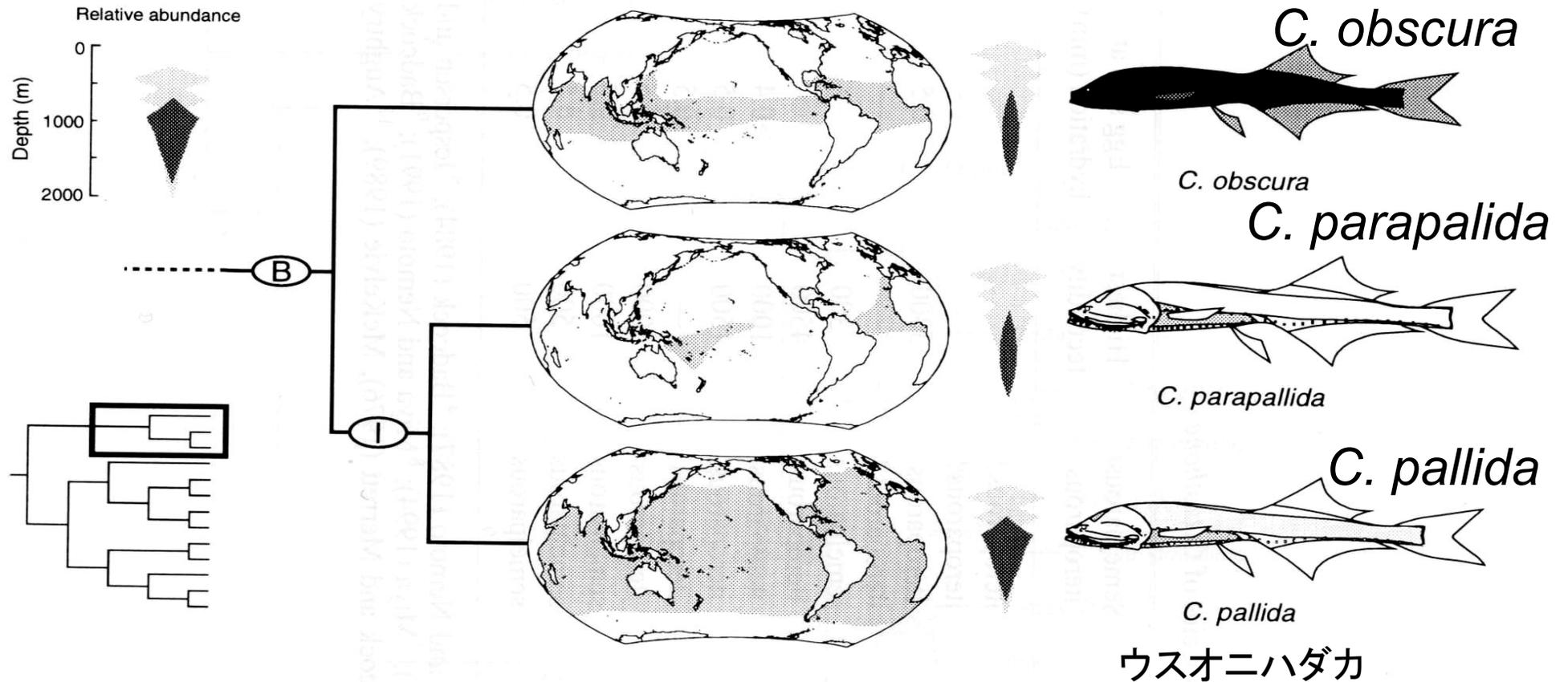
\*世界で最も個体数の多い脊椎動物のグループ

# オニハダカ属の分子系統



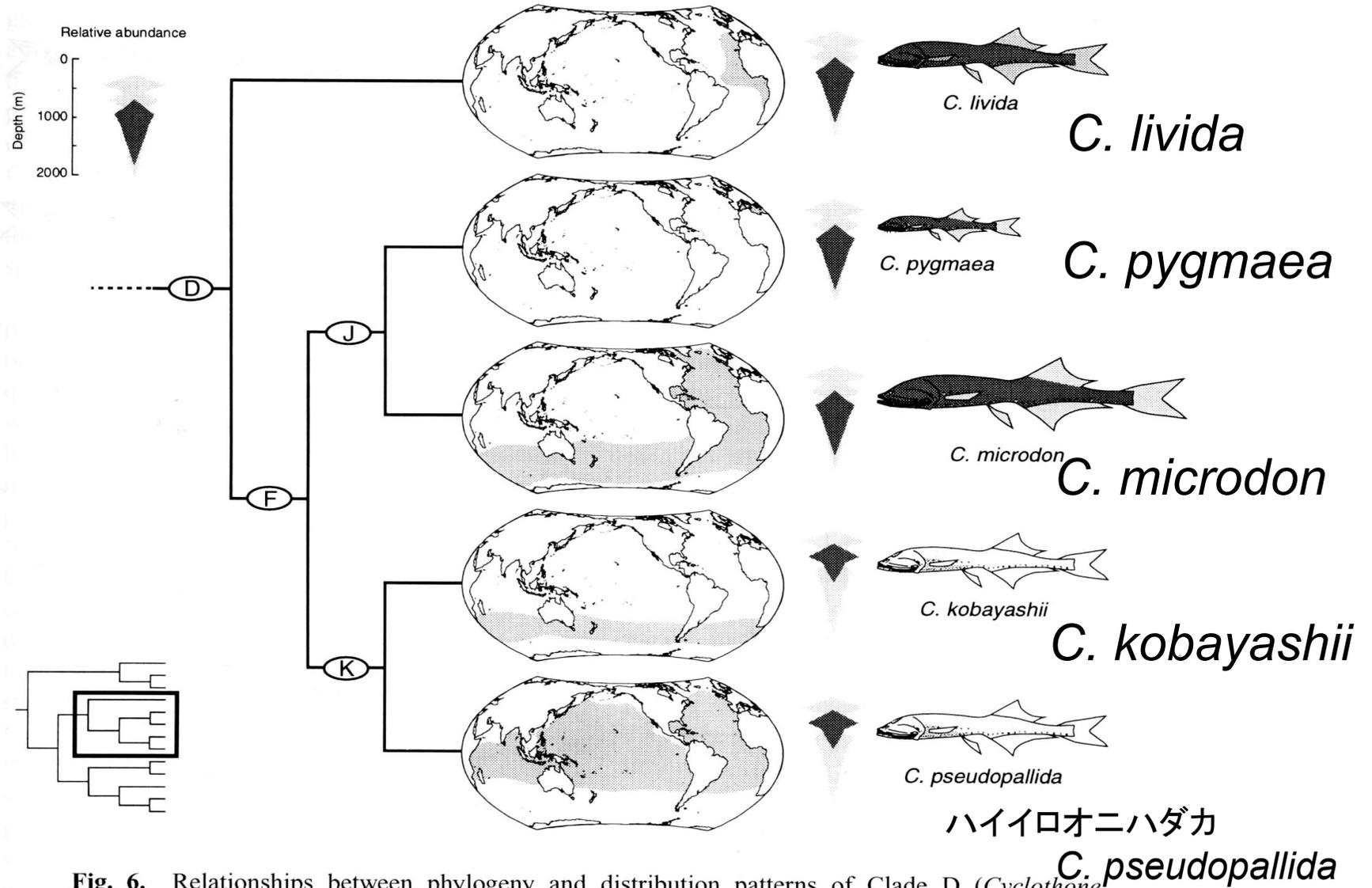
**Fig. 3.** The single most parsimonious tree of *Cyclothone* and outgroup taxa. Internal branches for the ingroup designated by capital letters A to L. Numbers above branches indicate bootstrap values obtained for 500 replicates and decay indices (d) up to five steps longer than the most parsimonious tree. Numbers below branches are unambiguous changes and unambiguous synapomorphies using ACCTRAN optimization. Size of fish illustrations proportional to the maximum size recorded (see Table 2).

# オニハダカ属の分子系統



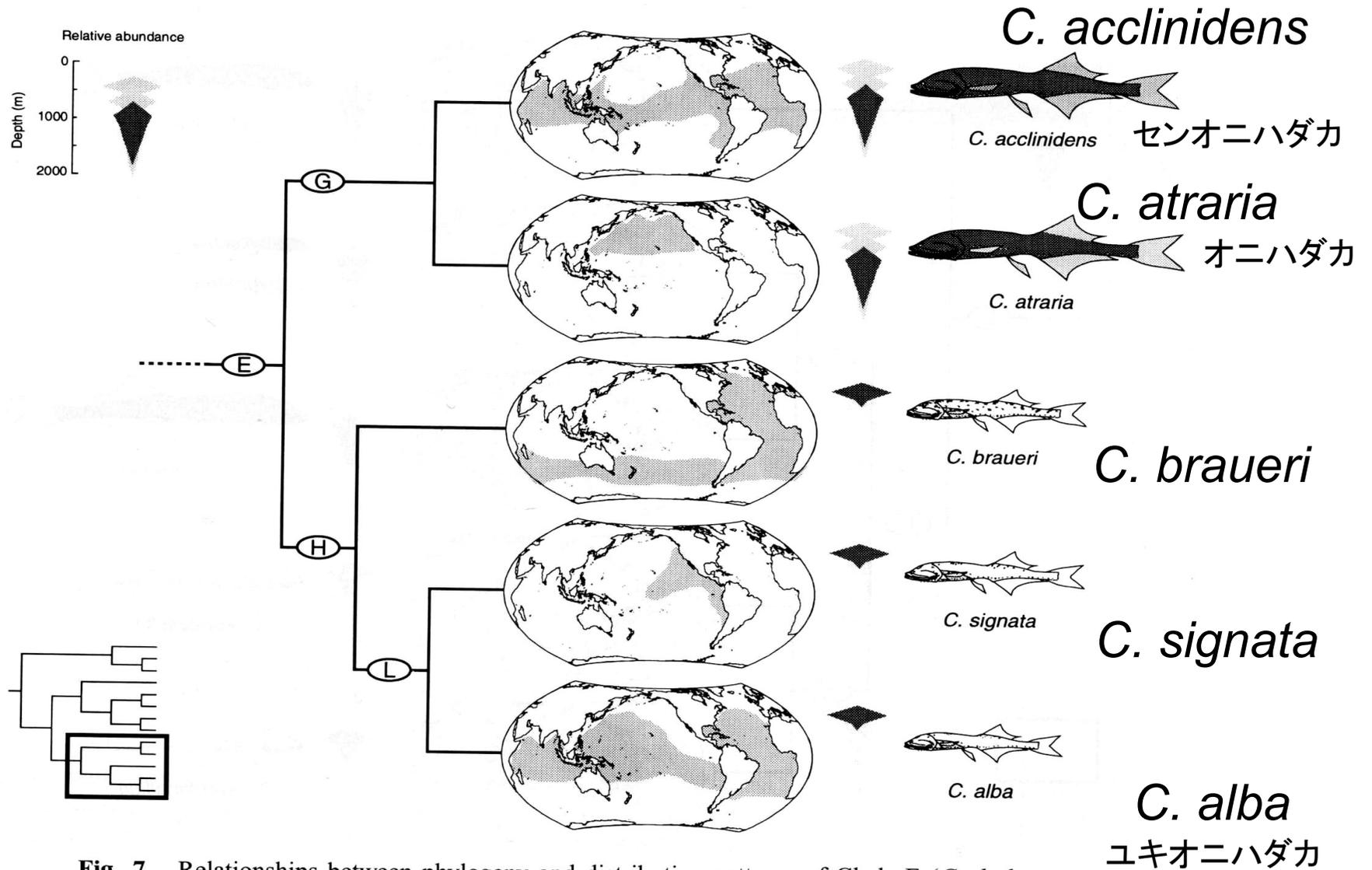
**Fig. 5.** Relationships between phylogeny and distribution patterns of Clade B (*Cyclothone obscura*, *C. parapallida* and *C. pallida*). Shaded portions of maps represent distributions based on literature (Mukhacheva, 1974; Badcock, 1982; Miya, 1994b) and unpublished records (Miya, unpubl. data). Vertical profiles of relative abundance indicated between maps and fish illustrations. Fish sizes proportional to largest size recorded.

# オニハダカ属の分子系統



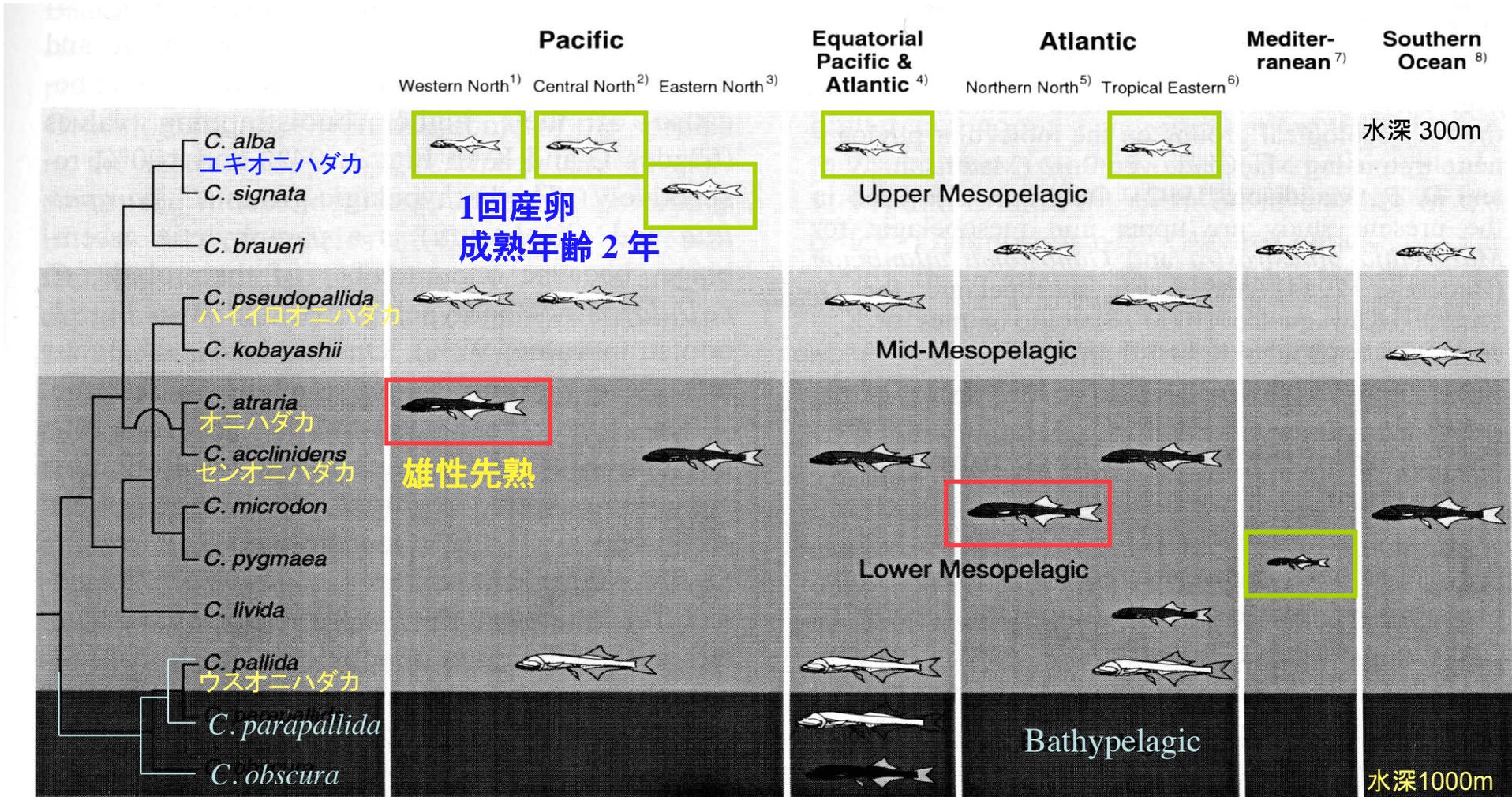
**Fig. 6.** Relationships between phylogeny and distribution patterns of Clade D (*Cyclothone livida*, *C. pygmaea*, *C. microdon*, *C. kobayashii* and *C. pseudopallida*). Shaded portions of maps represent distributions based on literature (Mukhacheva, 1974; Miya, 1994a) and unpublished records (Hartel, pers. comm.; Miya, unpubl. data). Vertical profiles of relative abundance indicated between maps and fish illustrations. Fish sizes proportional to largest size recorded.

# オニハダカ属の分子系統



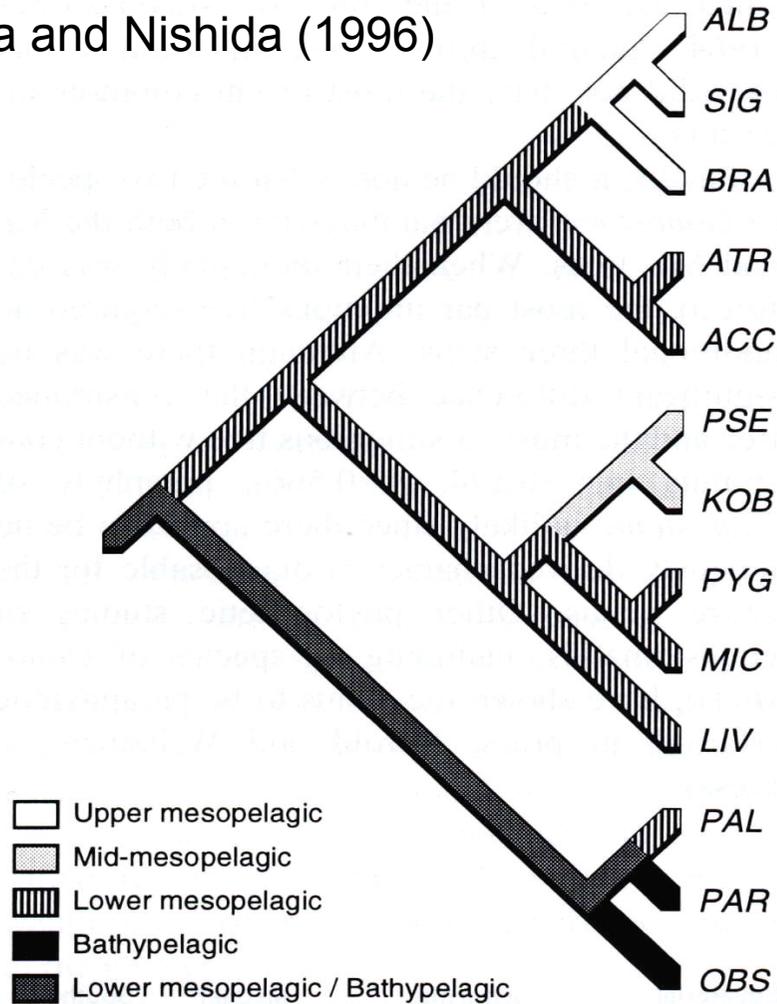
**Fig. 7.** Relationships between phylogeny and distribution patterns of Clade E (*Cyclothone acclinidens*, *C. atraria*, *C. braueri*, *C. signata* and *C. alba*). Shaded portions of maps represent distributions based on literature (Mukhacheva, 1974; Miya, 1994a) and unpublished records (Miya, unpubl. data). Vertical profiles of relative abundance indicated between maps and fish illustrations. Fish sizes proportional to largest size recorded.

# Miya and Nishida (1996): オニハダカ属の系統仮説と生息水深



**Fig. 9.** Combinations of co-dominant species in selected localities from the Pacific, Atlantic and Southern oceans and the Mediterranean Sea. No Indian Ocean data available. Vertical sequences of fishes within each depth category do not infer actual depth stratification. Fish sizes proportional to largest size recorded. Sources of information: <sup>1)</sup>Miya and Nemoto (1991); <sup>2)</sup>Maynard (1982); <sup>3)</sup>DeWitt (1972); <sup>4)</sup>Badcock (1982), Miya, unpubl. data; <sup>5)</sup>Badcock and Merrett (1976); <sup>6)</sup>Badcock and Merrett (1977); <sup>7)</sup>Goodyear et al. (1972); <sup>8)</sup>Miya (1994a).

Miya and Nishida (1996)



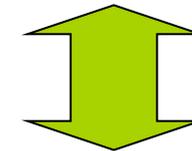
**Fig. 10.** The most parsimonious reconstruction of the four ecological groups on the molecular phylogenetic tree using MacClade ver. 3.02 (Maddison, W. P. and D. R. Maddison, 1992). Outgroup taxa used in the present study are upper-mid mesopelagic for *Margrethia obtusirostra* and *Gonostoma atlanticum* (Badcock, 1984) and lower mesopelagic for *G. gracile* (Kawaguchi, 1973). Specific names of *Cyclothone* abbreviated to first three letters.

## オニハダカ属の進化

### 浅層種

小型,早熟,1回産卵,  
産卵数が少ない

卵は300~1000個



しかし,例外も...

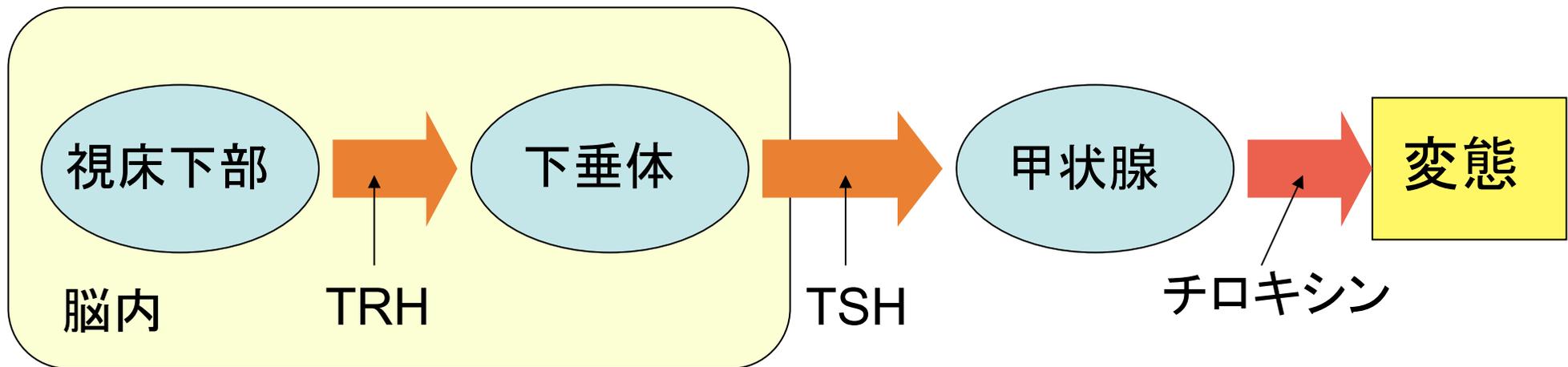
### 深層種

大型,晩熟,多数回産卵,  
産卵数が多い

卵は1500~4500個

卵のサイズは 0.5 mm

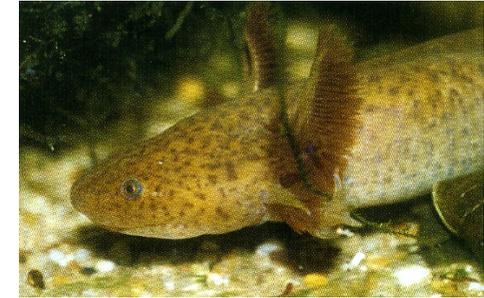
# アホロートルのネオテニー：変態の仕組み



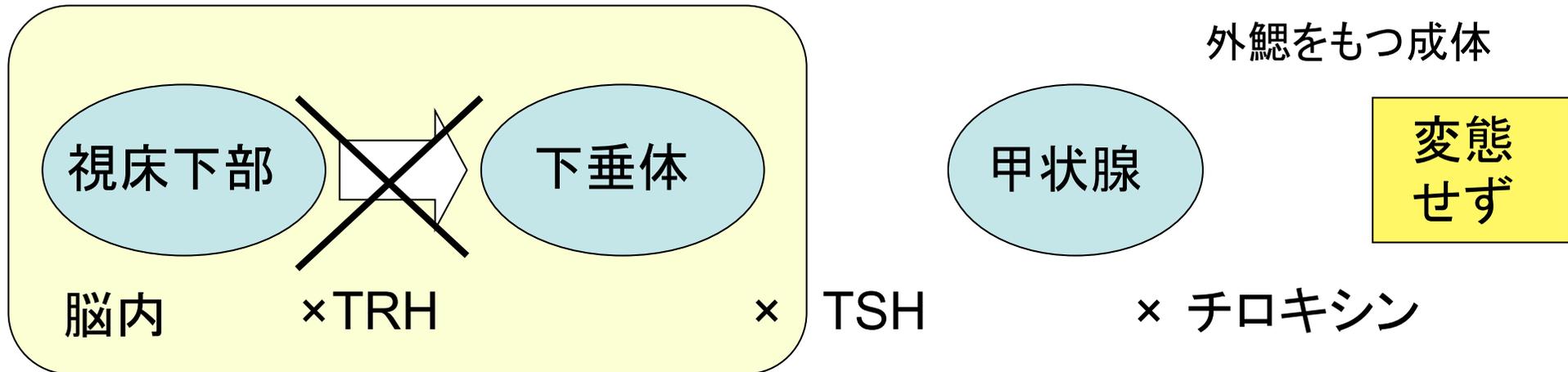
TRH=甲状腺刺激ホルモン放出ホルモン

TSH=甲状腺刺激ホルモン

# アホロートルのネオテニー：変態の仕組み



外鰓をもつ成体

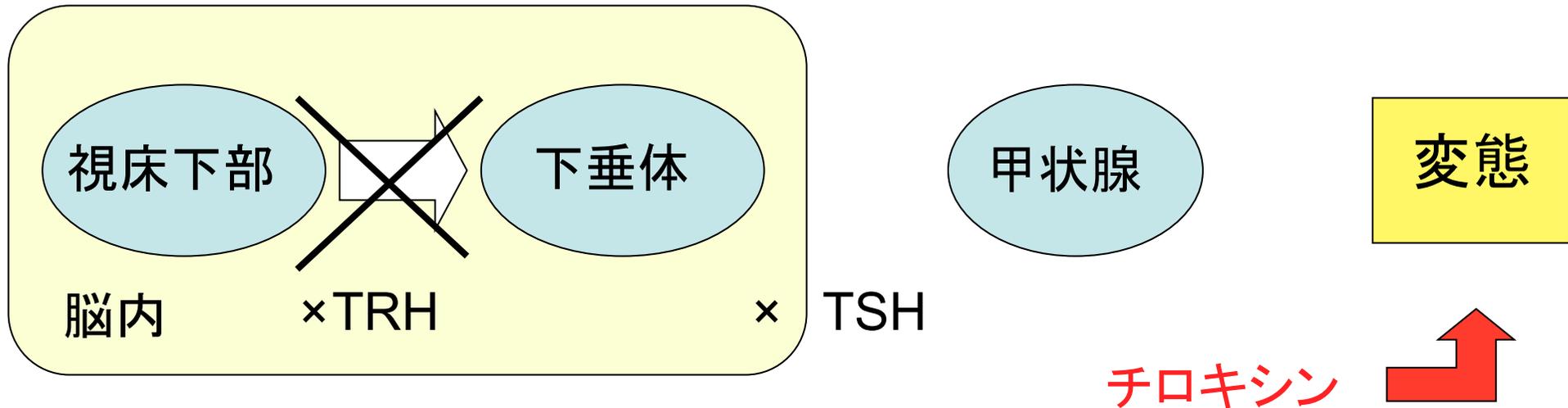
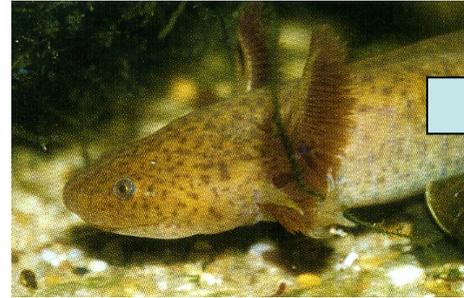


TRH=甲状腺刺激ホルモン放出ホルモン

TSH=甲状腺刺激ホルモン

最初のホルモンが放出されないために幼形化

# アホロートルのネオテニー：変態の仕組み



TRH=甲状腺刺激ホルモン放出ホルモン

TSH=甲状腺刺激ホルモン

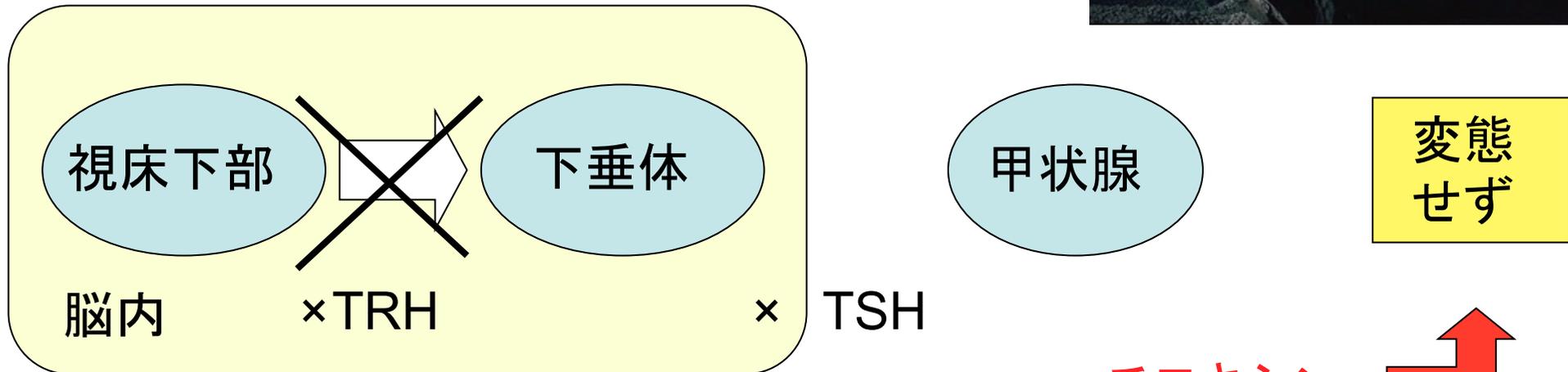
細胞のホルモン感受性は残っているため、変態できる



### ネオテニー的な祖先から進化

- 1) 餌の乏しい洞窟内に生息
- 2) 極めて長期の絶食に耐える
- 3) 変態せずに10~12年後に成熟する
- 4) 寿命が極めて長い(80~100年?)
- 5) 稀に卵を産まず幼生を産む  
(通常は直径8~12ミリの卵を石の下などに産む)

# アホロートルのネオテニー：変態の仕組み



TRH=甲状腺刺激ホルモン放出ホルモン  
TSH=甲状腺刺激ホルモン

極めてネオテニーな祖先から進化  
細胞のホルモン感受性が失われた  
(環境「光」が影響)