Kinship ties influence behavior, morphology

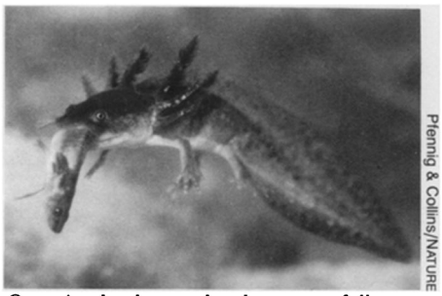
Scientists often talk about animals recognizing and consequently helping their kin. Such aid benefits the helper by promoting the spread of genes the relatives have in common. Two new reports show how organisms practice this concept, known as inclusive fitness, sometimes carrying it to extremes.

Behavioral ecologists have demonstrated that young tiger salamanders in Arizona can transform into voracious cannibals, especially in the company of strangers. In addition, the cannibals prefer to devour those young that are least closely related to themselves, says David W. Pfennig of Cornell University.

For their experiments, Pfennig and James P. Collins of Arizona State University in Tempe placed larvae from eight families in one of three situations. In the first, they set up 80 aquariums, each with 16 larvae from the same brood. An additional 40 aquariums each contained eight siblings from one family and eight from a second family, though sometimes the second eight were cousins of the first. Another 40 aquariums contained a pair of siblings from all eight families.

Normally, these gilled larvae munch on invertebrates, but in about 85 percent of the two mixed groups, one salamander quickly grew much larger than the rest. It also developed a broad snout and hard, bony plates with long, curved teeth well suited for catching smaller salamanders. Cannibals developed only 40 percent of the time in single-family aquariums and tended to do so later, when their siblings were less vulnerable, Pfennig and Collins report in the April 29 NATURE.

They also discovered that the cannibals preferred unrelated salamanders to cousins and cousins to siblings. "They can discriminate kin from nonkin," says Pfennig. The research shows that this information affects not only behavior — the cannibal chooses to eat unrelated larvae, leaving more resources available to siblings — but also morphology, something researchers tend to think of as less plastic than behavior, Pfennig notes.



Pfennig & Collins/NATURE

Oversized salamander devours a fellow larva, most likely unrelated.

"Their findings are exactly what you'd predict from inclusive fitness [theory]," comments George J. Gamboa of Oakland University in Rochester, Mich.

Gamboa does not know of other examples where kinship affects growth or development in animals, including humans. Pfennig cites two studies showing that plants grow better when potted with kin.

European scientists have observed a slightly more puzzling example of inclusive fitness among pilot whales. These whales travel in pods that sometimes number more than 100 males and females with their young. Whales within a pod are closely related, but the pod's males do not father the young in the group, reports Bill Amos, a geneticist at the University of Cambridge in England. He and Christian Schlötterer and Diethard Tautz from the University of Munich in Germany performed extensive analyses of genetic material obtained from two pods caught off Denmark by Faeroe Island fishermen, one of the few groups to hunt these marine mammals.

In 1991, Amos reported that each pod represents one extended family and that adult males and females stay close to their mothers. Now, an examination of DNA from 34 fetuses from those pods has revealed that outsider males parented at least 33 of them. Also, it seems that those outsiders belonged to groups of related males, the researchers report in the April 30 SCIENCE.

Amos and his colleagues suggest that males find mates when two pods intermingle — boaters have observed aggregations of more than 1,000 pilot whales — or that the males may occasionally wander off for a brief mating foray.

In some social mammals, young adult males tend to leave their family units altogether. If males stay with their relatives, they form a social structure in which a few dominant males do almost all the mating.

Because they encounter enough other pods, male pilot whales, and perhaps killer whales, may promote their genes best by spending their time helping their mothers and sisters and mating outside the pod, the scientists conclude.

— E. Pennisi

Dyslexia risk linked to summer births

A new study suggests that children born in summer months stand the greatest chance of developing dyslexia, a reading disorder that may afflict up to 9 percent of children in the United States.

This seasonal pattern may result from the exposure of women in the second trimester of pregnancy to influenza or other viral diseases during late winter, theorize Richard Livingston, a psychiatrist at the University of Arkansas for Medical Sciences in Little Rock, and his colleagues. Viruses may subtly derail the paths traveled by brain cells during that crucial stage of fetal development, the researchers maintain.

The finding of seasonal clustering requires confirmation by other investigators, but it coincides with evidence implicating viruses and other sources of potential harm to the fetal brain as contributing causes of schizophrenia (SN: 9/19/87, p.180), autism, mental retardation, and hyperactivity.

"Second-trimester viral exposure is presently the most attractive hypothesis to account for a seasonal birth pattern in dyslexia," the researchers conclude in the May JOURNAL OF THE AMERICAN ACADEMY OF CHILD AND ADOLESCENT PSYCHIATRY.

However, brain changes that lie behind dyslexia should prove "significantly more discreet" than those presumed to foster a severe mental disorder such as schizophrenia, Livingston notes.

Livingston and his co-workers reviewed data on 585 boys born between 1948 and 1970 who were referred to a university psychiatric clinic, often for behavior or learning problems. Boys ranged in age from age 9 to their early 20s. A total of 173 suffered from dyslexia, defined as a reading score on standard tests falling at least two years behind the expected level despite a normal IQ.

Too few dyslexic girls attended the clinic to allow for an analysis of their risk of developing the disorder.

Overall, boys born in May, June, or July displayed more than twice the risk of developing dyslexia as boys born in any other month, the investigators found. Births in these three months accounted for 40 percent of all instances of dyslexia, Livingston says.

The risk of being born dyslexic peaked during particular spans of years, the psychiatrists note. The most pronounced risk was from 1950 to 1954, when summer births accounted for seven in 10 cases of dyslexia. A review of Arkansas state health records indicates that the greatest number of cases of influenza and measles occurred in the years during which the most dyslexics in the sample were born, Livingston says.

Complications other than viral exposure may disturb fetal brain development and foster dyslexia among children born in non-summer months, he adds. For instance, compared with summer-born dyslexics in the Arkansas sample, dyslexic boys born from November to January experienced substantially more premature births, size abnormalities at birth, and birth-related head injuries.

"I suspect different types of early brain insults can cause dyslexia," Livingston says.

— B. Bower