

Aptos' 8-legged frogs investigated

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APTOS — Biologists are trying to decipher a baffling quirk of nature in a giant frog pond where hundreds of amphibians are developing more than their usual complement of legs — some as many as eight.

For years scientists have known that frogs and salamanders have the genetic capability to generate new limbs when any of the original ones are severed.

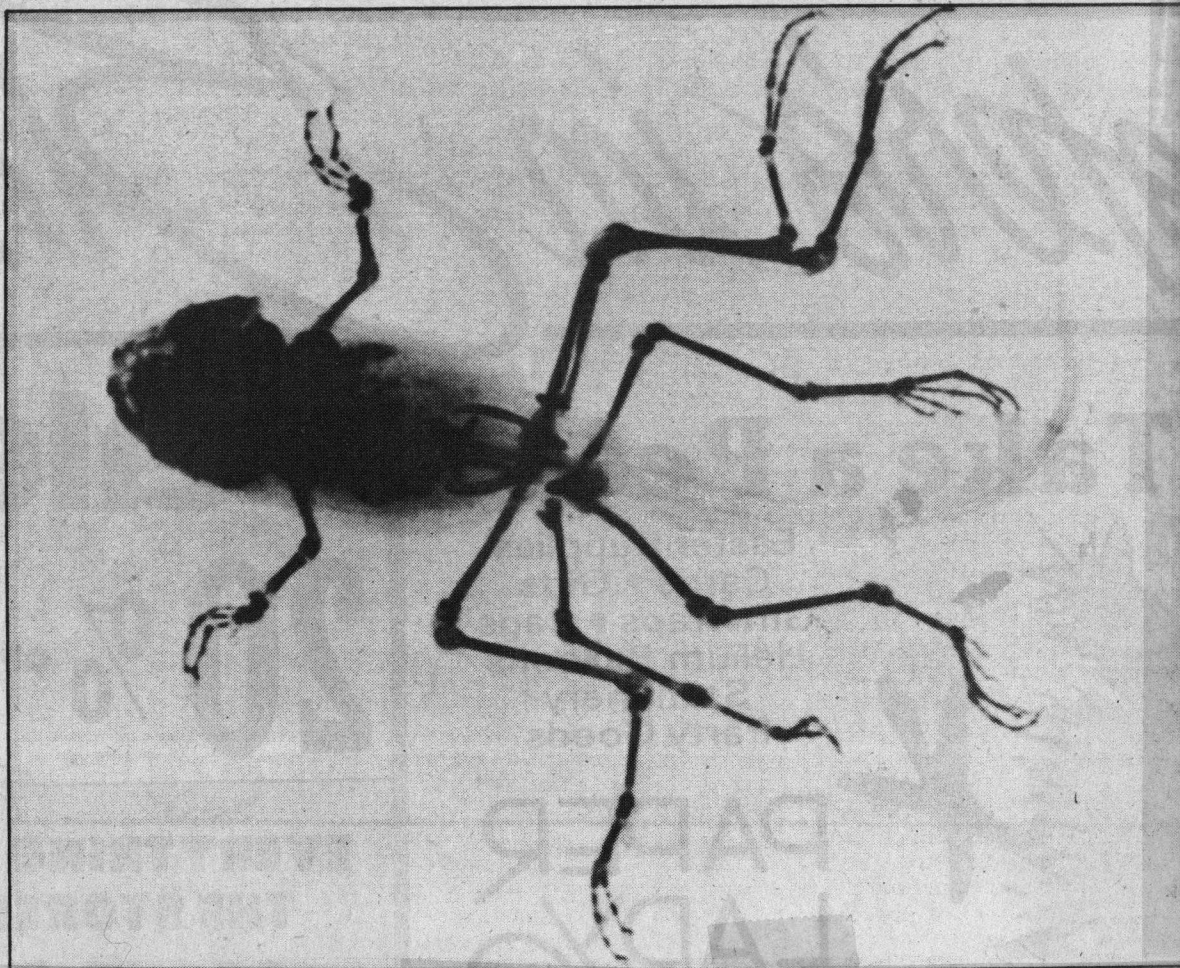
But just coming to the attention of scientists who are studying the inhabitants of a snail-infested pond in the Seascap uplands of Aptos are the ways in which parasites can play tricks on the normal growth and differentiation of cells.

"You can experimentally produce extra limbs in frogs and salamanders," said developmental biologist Stanley Sessions of UC-Irvine.

"But the effect we're seeing in the pond is a natural experiment like the kind we would see in the lab if we disturbed natural development."

He said that the abnormal animals were recently found by accident during an environmental impact study prior to a construction project that would encompass the area of the pond. The affected tadpoles were sent to his laboratory for study.

Estimates now show that 70



The useless extra limbs make the frogs easy prey.

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percent of the tadpoles in the pond have unnatural limb growth and all of those with extra limbs are infested with the larvae of trematodes, insidious parasitic flatworms.

The worms are a relative of the schistosomiasis flatworm that causes organ damage and dysentery in people, especially in some underdeveloped nations where the larvae flourish in untreated bodies of water.

Larvae of both types of worms use snails as their first hosts where they undergo several stages of development, but before they can become fully functioning

worms they require yet another host.

In the case of the schistosomiasis worms, snails and people are the hosts, while for trematodes, the hosts are snails and amphibians.

The trematodes, Sessions has found, are burrowing into the eggs of developing frogs and salamanders, affecting their embryonic development.

"Both the frogs and salamanders in this pond have massive infestations," said Sessions, who noted that the tadpoles are growing extra hind legs while the salamanders are developing additional forelimbs.

"They're bombarded by these trematode larvae that are breaking up the limb field into little departments," he said in reference to the area of the embryos' bodies from which limbs sprout. "So

before the embryonic frog or salamander has a chance at natural development, the process is completely distorted."

Studies of the amphibians so far suggest that the number of extra legs may depend upon the stage of embryonic development when the frog or salamander is affected by the larvae.

"I don't think the genes are being tricked here," said Sessions. "The cells are being tricked by the larvae because the genetic system of the frog is completely ignorant to what's going on in this case."

"The cells are genetically competent to make a limb, true, but it is the distortion by the larvae infestation that is contributing to development of the extra limbs."

However, the exact mechanism the larvae use to disturb natural development is still a mystery, Sessions said.

"The kingpin of the whole problem is the snails. You can't release poisons into the water because you would kill off everything else. But the Chinese had a solution for the snails. They sent people out with sticks and crushed them all to death."

Sessions said that this is only the third time in the 20th century that scientists have witnessed pollywogs undergoing unusual limb growth in a natural habitat.

Unfortunately, the extra limbs do not have much nerve development, a factor that makes them virtually useless to the animals and slows their locomotion. The less agile amphibians are then rendered helpless and easy prey for snakes and other predators, the biologist said.

Animals

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