A team of scientists gathered on Magnetic Island for the recent coral spawning in a bid to further their genetic studies which may eventually help medical science's knowledge of the brain and central nervous system. IAN FRAZER reports

Male mushroom coral release sperm during spawning on the Great Barrier Reef

Unzipping genes

DAVID Miller keeps an eye on the moon and a toe in the sea this time of year in quest to understand the mainframe, if not the meaning of life.

Dr Miller, a JCU molecular biologist, joined a large team of scientists on Magnetic Island last weekend watching coral reproduce in toddlers' wading pools, and collecting embryonic offspring.

They began diving for chunks of the living-rock-like coral called *Acropora* last Friday, the day after the second full moon of spring, when corals mingle their gametes in an event some island promoters have called sex on the beach.

Using the same tacky analogy, the scientists' routine with plastic buckets and rubber dinghies at Geoffrey Bay eight days ago could possibly be seen as a prelude to unzipping genes.

Dr Miller arrived in Townsville in 1985, soon after JCU marine biologists found that the kilometres-long slicks which appeared on the reef each spring actually contained billions of embryonic organisms.

"The thing that got me interested in biology as a kid in Britain was seeing films about the Great Barrier Reef and its diversity of marine life," he said on Wednesday.

"I was sidetracked into laboratory science, but wound up here and close to the reef by accident in 1985, as a temporary lecturer in the then department of chemistry and biochemistry.

"There was a lot of biology going on here in respect of corals ... (but) no-one was doing any molecular genetics. There was an obvious niche."

He decided to make use of the abundant and easily accessible quantities of embryonic material to deduce and describe the genetic blueprint of the *Acropora,* just as scientists had described the ubiquitous fruit fly known as *Drosophila* during the previous 100 almost years.

His project was and still is the only one of its kind in the world to study the genetic make-up of the *Acropora,* in quest of the few hundred master-control genes thought to be common to lower animals and human beings.

He chose the *Acropora* as a model lower animal, a cnidarian family member regarded, along with other corals and hydra, as the simplest animal in which true tissues are present.

Fifteen years later he and his collaborators, Dr Eldon Ball, of the Australian National University and Professor Rob Sant, of the University of Adelaide, have identified about 3000 of the *Acropora's* estimated 15,000 or so genes.

Dr Ball was on the island last weekend along with students from the University of Adelaide and Southern Cross University.

Dr Miller and Prof Sant say the *Acropora* contains many of the genes known to play critical roles in development of both the widely studied *Drosophila* and mammals.

Dr David Miller with a coral sample. *Photo: EVAN MORGAN* EM194A02

They described their work recently in the Australian magazine *Today's Life Sciences,* in what Dr Miller says was a prelude to full scientific papers on the project.

In this article, they said *Acropora* appeared to have inherited, with higher animals, a common set of genes that were present in a common ancestor at the dawn of the animal kingdom.

Acropora appeared to have "frozen" what it inherited, while higher animals had exploited the potential in this genetic material, through a number of evolutionary processes.

They noted what they described as corals' remarkable ability to regenerate themselves and the "surprising" number of genes in common with higher animals.

"(This) implies that *Acropora* could provide unique perspectives on complex phenomena such as the development of the vertebrate nervous system," they said.

News reports in September based on the magazine article suggested that their findings could be used to help people with spinal and brain injuries.

However, Dr Miller played down this inference on Wednesday.

"I am sure there will be some implications for medicine but we are basic scientists with no clinical ambitions," he said.

"That's not what we are doing. I hope there will be some medical geneticists who will take this up, but our work is a very long way from clinical science."

He said the main point of the article had been to announce that they had identified 3000 *Acropora* genes by pinpointing sequences of ribonucleic acid (RNA), "messengers" from the corals' genetic material.

"With this project it's given us a swag of genes clearly related to genes in humans and *Drosophila,*" he said.

"The traditional animal of choice (for developmental biology) has been the fruit fly, with a small amount of genetic material and a short life cycle.

"It has limited genes and has been studied for almost 100 years. Lots of mutants are available.

"People have assumed that if a gene is present in humans and not in *Drosophila* humans must have invented the gene, but some are present in coral and humans and not *Drosophila.*"

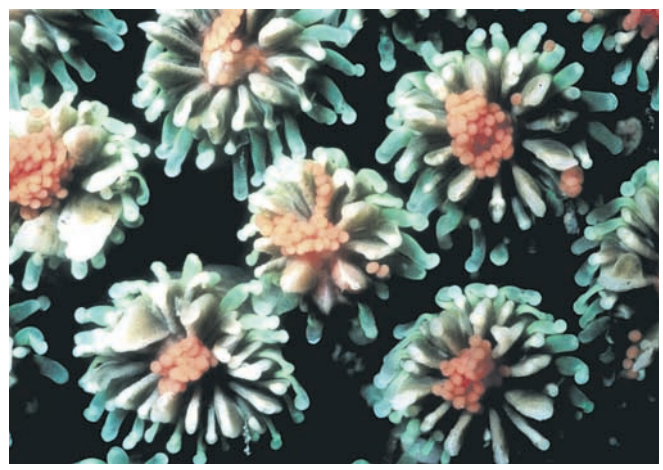
In fact, *Drosophila* appeared to have shed some genes because of its specialised lifestyle.

He said they had identified the genes using a Express Sequence Tag process, financed with a $50,000 grant from the Australian Genome Research Facility in Brisbane.

He described the process as an effective, "poor-man's genome project".

Their next step would be extensive testing to determine the function of some of these genes, in a search for master-control genes.

One of the problems with trying to understand the functions of genes in animals like corals was that classical genetic tests of function were not possible.



Star coral spawning eggs on the Great Barrier Reef

Instead, techniques such as transgenic expression — for example expressing coral genes in flies — could provide a powerful tool to identify cases of common gene function.

"If a fly has a similar gene to the coral, then it is possible to see if the coral gene can do the same job as the fly gene normally does," Dr Miller said.

To do these experiments, Dr Miller's lab collaborates with a number leading *Drosophila* laboratories, including that of Professor Walter Gehring, of the University of Basel, in Switzerland.

Meanwhile, Dr Miller has replenished his stocks of fledgling *Acropora* in various stages of development after last weekend's successful expedition at Nelly Bay.

This week he and his collaborators have been raising coral larvae and storing them, by freezing in liquid nitrogen and fixing in preservatives.

"Spawning has been going really quite well," he said in an e-mail on the project.

"The unusually hot spring weather and the relative lateness of the full moon led to our *Acropora* coral spawning early in the lunar cycle, but we were ready for that.

"The majority of *Acropora* colonies spawned last Friday night, whereas the 'normal' prediction would have been Monday or Tuesday nights this week'."

Summing up their work in a recent radio talk, Dr Miller said several key genes previously thought to be "inventions" of mammals were present in coral.

"It seems humans have done very little of novelty," he said.

"This includes genes central to the process of building a brain and nervous system.

"Because the coral is a relatively simple animal, we hope that by learning how it can dismantle and rebuild its nervous system, to get new perspectives on nervous system development and regeneration in vertebrates."