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The researchers hope that work on A. millepora—the species that has been most extensively studied at the molecular level—will point to ways to minimize global warming–inflicted damage to the 2000-kilometer-long Great Barrier Reef, which generates $4 billion a year in revenue. Diseases, settling far away. That wanderlust, an evolutionary adaptation to cope with changing sea conditions, may be the key to survival for coral reefs as the planet warms.

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“Tomorrow, they’ll start swimming,” Ukani says. After reaching this stage out on the reef, some larvae corkscrew down to the bottom, looking for a patch of sea floor that they will call home for the rest of their lives—as long as 100 years. Other larvae drift for months, eventually settling far away. That wanderlust, an evolutionary adaptation to cope with changing sea conditions, may be the key to survival for coral reefs as the planet warms.

—CHERYL JONES

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MOONLIGHT SONATA ON THE REEF

All ashore! Anticipating that spawning is about to begin, researchers haul small colonies of Acropora millepora onto Magnetic Island in seawater bins.

hope to get most of the coding sequence out next year. Already, their labs have identified about 10,000 genes in A. millepora. Some, including genes critical to the vertebrate immune system, were once thought to be vertebrate innovations because they were absent from the fruit fly and the nematode worm, the archetype of invertebrates. “It’s a vertebrate-centric view of the world,” says William “Bill” Leggat of JCU.

Miller and Ball hope to find out which proteins among coral’s repertoire of tens of thousands are expressed at various stages of development and in response to environmental shocks. In one fine-grained study, Miller is using genomic data to zoom in on the molecular basis of symbiont uptake and calcification. The research will include a comparison of coral genes with the full genome sequence of the sea anemone (Science, 6 July, p. 86). Another project, by Victor Hugo Beltrán Ramírez of JCU, is probing two proteins that turn on corals’ vivid green and red fluorescence. The proteins may be involved in either photosynthetic enhancement or photoprotection in adult corals.

Leggat and François Seneca are investigating coral bleaching, a phenomenon in which coral polyps expel their algal symbionts if water exceeds the seasonal average temperature by 2°C for a couple of weeks. They want to find out which genes are switched on during the crises, which can wipe out entire reefs. The Magnetic Island reefs were hit hard by bleaching in 2002. One hypothesis is that free radicals generated by the heat-stressed symbionts disable their ability to photosynthesize. Coral somehow senses this and ousts its partners.

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The researchers hope that work on A. millepora—the species that has been most extensively studied at the molecular level—will point to ways to minimize global warming–inflicted damage to the 2000-kilometer-long Great Barrier Reef, which generates $4 billion a year in revenue. Diseases, most of them poorly understood (see sidebar, p. 1716), and urban runoff are among the villains. A looming threat is acidification of the seawater from dissolved carbon dioxide (Science, 4 May, p. 678, and p. 1737 of this issue).

To address these critical issues, four teams came to Magnetic Island to raise larvae. There’s no magic formula. Some scientists filter and change water regularly, whereas others say this stunts larval growth. In an even simpler approach, a team led by ecologist Andrew Baird of JCU raises larvae in $1 buckets for studies about how temperature affects the larva’s ability to latch onto energy-giving algal symbionts.

A group led by Miller and Eldon Ball of the ARC Centre for the Molecular Genetics of Development has the big picture in focus. They are using high-throughput sequencers to compile a catalog of expressed genes as part of a “poor man’s coral genome project.” They