

SCIENCE & TECHNOLOGY

ENVIRONMENT

Boulders bolster reef restoration

Researchers bring in 90,000 tonnes of limestone to reclaim oyster habitat in Gulf of Mexico

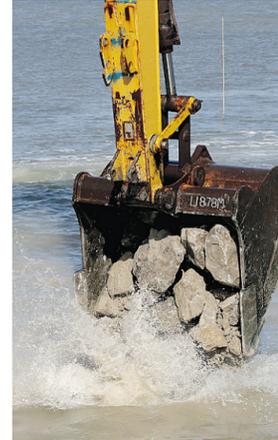
RAMIT PLUSHNICK-MASTI
THE ASSOCIATED PRESS

MATAGORDA, Texas — A deep sea oyster reef restoration being touted as the largest ever in the Gulf of Mexico began in an unlikely place: a quarry in landlocked Missouri.

That is where years of research, planning and precise engineering led Mark Dumesnil, an associate director of restoration for the Nature Conservancy in Texas, as he sought to restore what was once a nearly 500-acre oyster reef and is now no more than hard sand and shell remains, with not one oyster in sight.

And so, about seven years after Dumesnil was first tipped off by wildlife ecosystem experts that restoration of Half Moon Reef might be possible, 36 barges carrying 90,000 tonnes of Missouri limestone travelled for 12 days down the Mississippi River, arriving in the gulf earlier this month. Scientists, engineers, researchers and labourers will spend some eight weeks dropping the boulders onto a 54-acre plot more than two metres underwater as part of a \$5.4 million US, two-phase project designed to revitalize a damaged ecosystem.

The project also will provide a robust natural barrier from hurricanes and teach scientists whether reefs can rebuild in



PHOTOS: PAT SULLIVAN/THE ASSOCIATED PRESS
A conservationist shows a live oyster, left, plucked from an existing reef in the Gulf of Mexico. Above, a shovel dumps huge limestone boulders into the gulf.

drought conditions, becoming another mechanism for marine habitats to withstand devastating dry spells.

"This project is designed to be innovative and different," said Dumesnil, who has financial backing from a variety of agencies, including the U.S. Army Corps of Engineers and the Texas General Land Office.

Oysters filter 190 litres of water daily. Each acre of reef the oysters cling to filters

another 90 million litres of water daily. Together, they are vital to a healthy marine ecosystem and to commercial fisheries because they are home, feeding and breeding grounds for hundreds and even thousands of other fish, shrimp, clams, crabs and other life. In Texas alone, the oyster industry is a nearly \$30 million a year industry, according to state statistics.

Oyster reefs, however, have

been severely damaged by overfishing and other causes during the last century. Nearly 50 per cent of the reefs in the gulf, and 85 per cent of those globally, have disappeared, according to The Nature Conservancy.

In 1907, a survey of Matagorda Bay done by the U.S. Bureau of Fisheries indicated Half Moon Reef covered 494 acres of seabed. Since then, however, a variety of factors led to a slow death, including the release in

the 1920s of a major logjam in the Colorado River that allowed large amounts of freshwater to flow into the estuary about 10 years later, upsetting the delicate salinity levels that oysters need to thrive; rerouting in the 1940s of the intracoastal waterway, which released tonnes of sediments, and may have helped bury and kill oysters; commercial dredging of live and dead oyster shells between 1922 and 1983, often to build

roads; and the damage from Hurricane Carla in 1961.

The idea behind this project, Dumesnil explained, and the reason boulders of varying sizes are being used, is to try to replicate as closely as possible a real reef, and to get the eventual growth of it to be vertical — as it would be if it were naturally occurring.

"If we were here 100 years ago ... we would see reef, oysters breaking the surface of the water. So you would see waves breaking on the oyster reef, it was that high, 6 to 7 feet high," said David Buzan, project manager for Atkins North America, a global engineering, design and project management consultancy firm. "Now, we're building a reef that's 3 feet high with the hopes that oysters will grow on it, colonize it and eventually return that oyster reef back to the height that it originally was 100 years ago."

The limestone from Missouri was specifically chosen because it was the precise material, Dumesnil said, needed to guarantee it wouldn't sink into the seabed allowing the oysters to build vertically. Project designers also decided to build 32 rows of 200-metre reefs, deliberately leaving space between them. The hope is that as the spat — or oyster babies — stick to the boulders they will eventually fill in the gaps while growing the reef vertically.



Gillian Shaw

DYING FOR SLEEP

Vancouver company's technology measures sleep patterns, finds the real cost of fatigue



Sleep is crucial

"Spring forward, fall back" means clocks get set back an hour at 2 a.m. Sunday so we get an extra hour of sleep.

How important is getting enough sleep?

Crucial, according to Sean Kerklan, chief executive of Vancouver's Fatigue Science. He is a sleep analyst who helps the Canucks keep their eyes open on the puck and counsels companies and individuals on how to optimize their workplace performance by improving their sleep patterns.

If you think you can get by without getting proper sleep, consider this: In a side-by-side test of two professional athletes, Fatigue Science found the one who has good sleeping habits and had a nap before playing a game had a reaction time more than twice as fast as his teammate who didn't get the extra shut-eye.

How does Fatigue Science track sleep?

Fatigue Science has developed the Readiband, a sensor that you wear on your wrist like a watch. Like Santa, it knows when you are sleeping, it knows when you're awake; it's the only wearable device that automatically detects sleep. It displays your effectiveness score: At 100 per cent, you're at the top of your game; at 70 per cent, it's like having a blood-alcohol level of .08 per cent.



Fatigue Science co-founder Pat Byrne with Readiband.

Fatigue avoidance scheduling tool

And there can be much more at stake than the outcome of a game. Fatigue Science carries out its sleep analysis and consulting for railway companies, airlines, mining companies, the military and others. In Australia, fatigue management has been incorporated in legislation that holds supervisors and companies responsible if they are found to have created working schedules that contributed to accidents from employee fatigue. Fatigue Science's fatigue-management system has been approved by the U.S. Food and Drug Administration and by Health Canada.

Quite simply, a lack of sleep can kill

It killed Fatigue Science co-founder Pat Byrne's nephew when he fell asleep driving. That led to Byrne's quest to find a way to measure the effect of long shifts and scheduling patterns on employee fatigue.

Fatigue has caused plane crashes, bus crashes and the like. If you get behind the wheel of your car and start driving when you are in the danger zone for lack of sleep, it's like driving drunk. Yet no one takes your keys away if you drive tired.

Time changes make it worse. Even though we're getting an extra hour of sleep this weekend, according to ICBC there's a 10 per cent increase in the number of Lower Mainland accidents during the afternoon commute for two weeks following the time change compared with the two weeks before. Rather than taking advantage of the extra hour of sleep, we stay up later.

Trying out the Readiband

I've been wearing the Readiband for close to a month. Fatigue Science analyzed the data it collected and here is what it revealed:

I get high marks for sleeping. I go to bed and wake up at the same time most days, I get eight hours of sleep most nights and even though I sometimes feel like I'm lying awake for hours at 3 a.m., apparently I'm getting enough uninterrupted

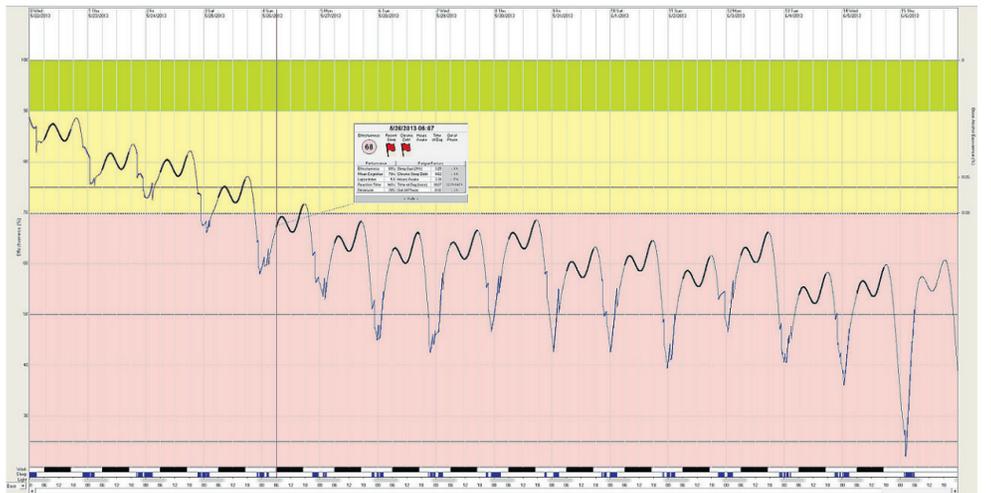
sleep. For complete analysis of my Readiband trial, check online at vancouver.sun.com/digital-life for a video in which Kerklan explains how my sleep patterns had an impact on everything from my ability to give a speech, to meeting story deadlines, to driving a car and sailing a boat in Vancouver's busy harbour.

Compare that to an oilsands worker who works for one of Fatigue Science's clients. The worker

had to wake up at 3 a.m. — the absolutely worst time to wake up according to Kerklan — and after a long bus drive, started work at 6 a.m. and put in a 12-hour shift. After he wore a Readiband to analyze his sleep and his alertness and ability to do his heavy equipment job, Sleep Fatigue found the worker was spending most of his working day performing at a level comparable to being impaired by alcohol.

It took only shifting the work day by an hour to improve that worker's and others' sleep to such a point that he was not spending the entire day working in the red danger zone when it came to alertness, but in a ready and rested zone of optimum or close to optimum performance.

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This FAST analysis of an oilsands worker's sleep pattern with his work schedule shows that most of his working day — the part shown by the black line — is spent in the red zone, meaning his reaction time is slowed.