

Historical Reconstruction of Population Density and Size of *Diadema antillarum*

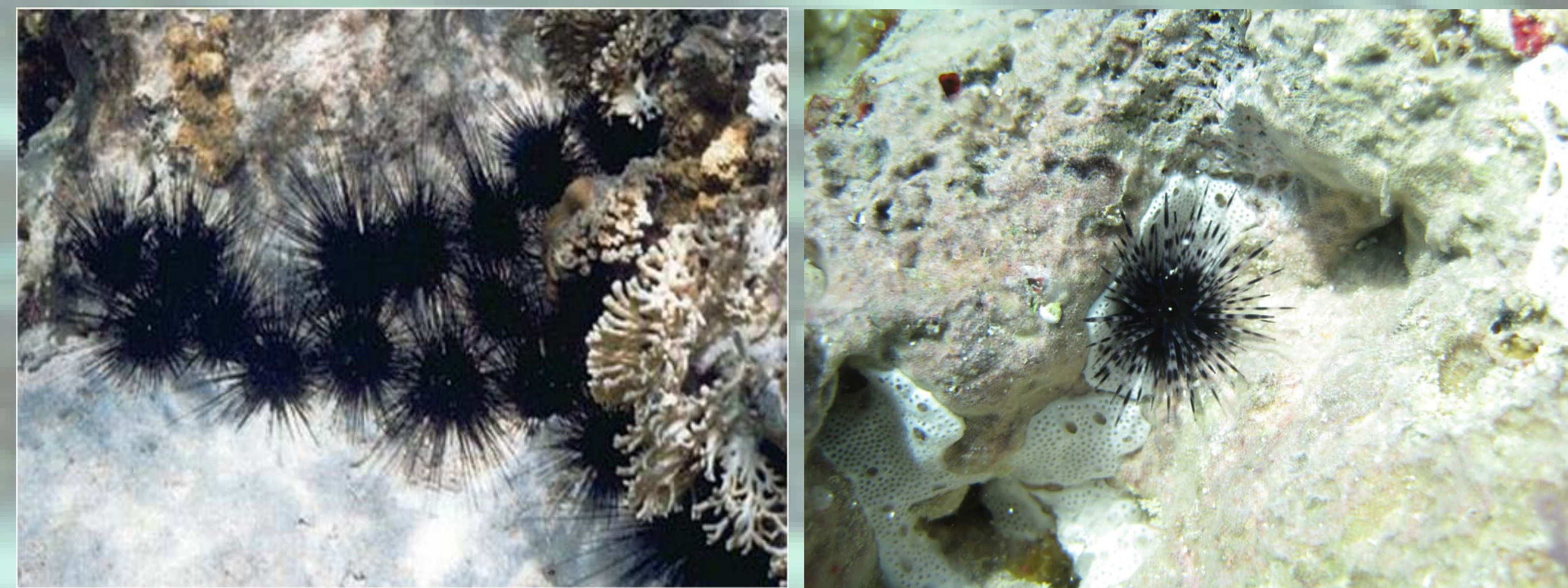


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Introduction

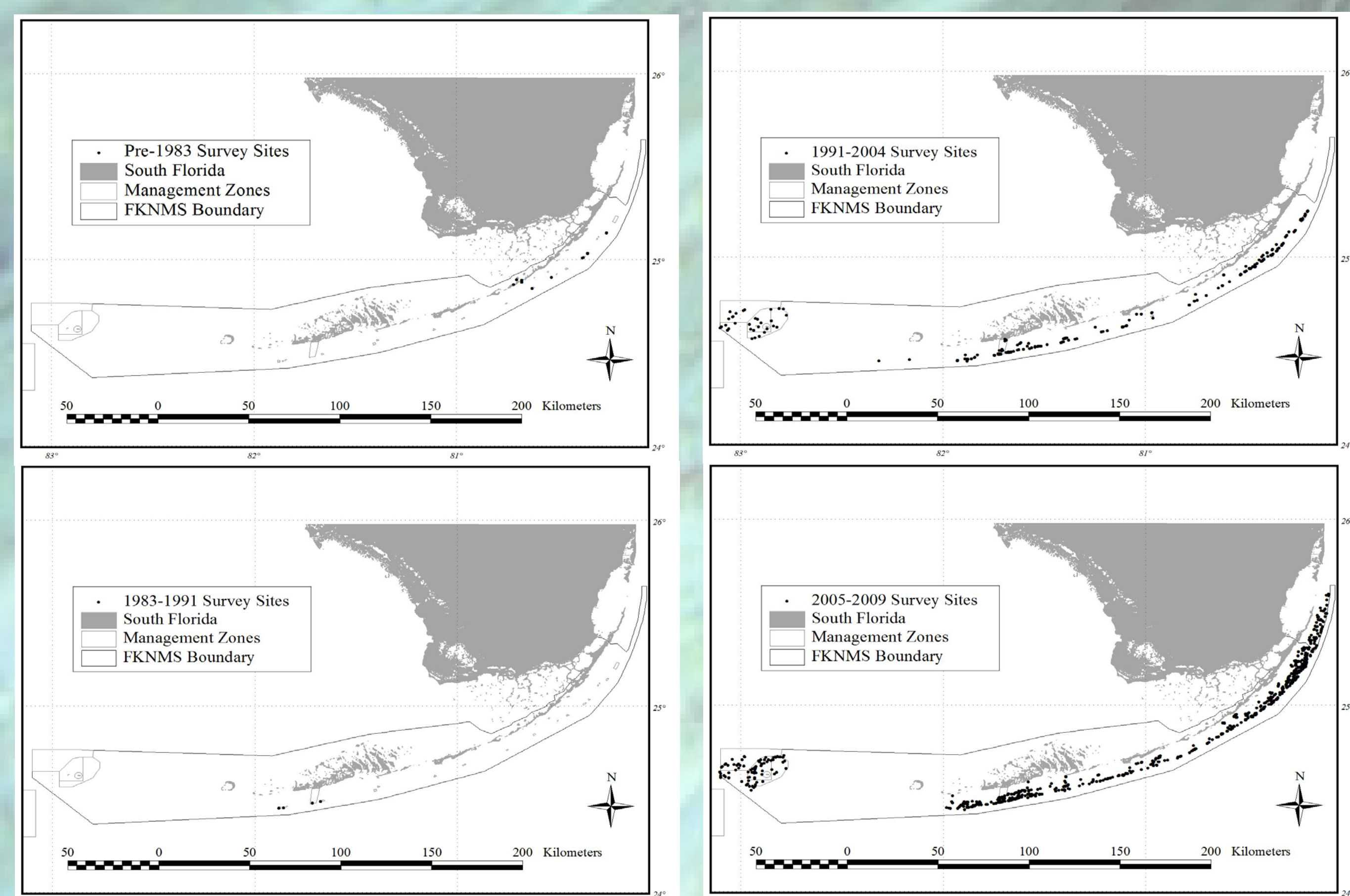
The once-ubiquitous long-spined sea urchin *Diadema antillarum* suffered a Caribbean-wide mortality in 1983-84 and a second mortality in the Florida Keys beginning in April 1991 (Forcucci 1994). The demise of this important reef herbivore is considered one of several factors responsible for coral reef change in the Florida Keys. However, published studies on *Diadema* density and/or size in the Florida Keys prior to 1983 are limited to just a few studies (e.g. Randall et al. 1964, Bauer 1980).



The long-spined sea urchin *Diadema antillarum* in an aggregation (left) and as a juvenile (right)

Urchin Surveys at Middle Sambo, 1972

Benthic surveys at nine reefs in the lower Keys were conducted during 1970-72. Quadrat counts of *Diadema* at Middle Sambo during July 1972 were made on the spur top (1.6-2 m, 30 m²), spur side (4-4.6 m, 28 m²), and sand groove (4.5-5 m, 25 m²).



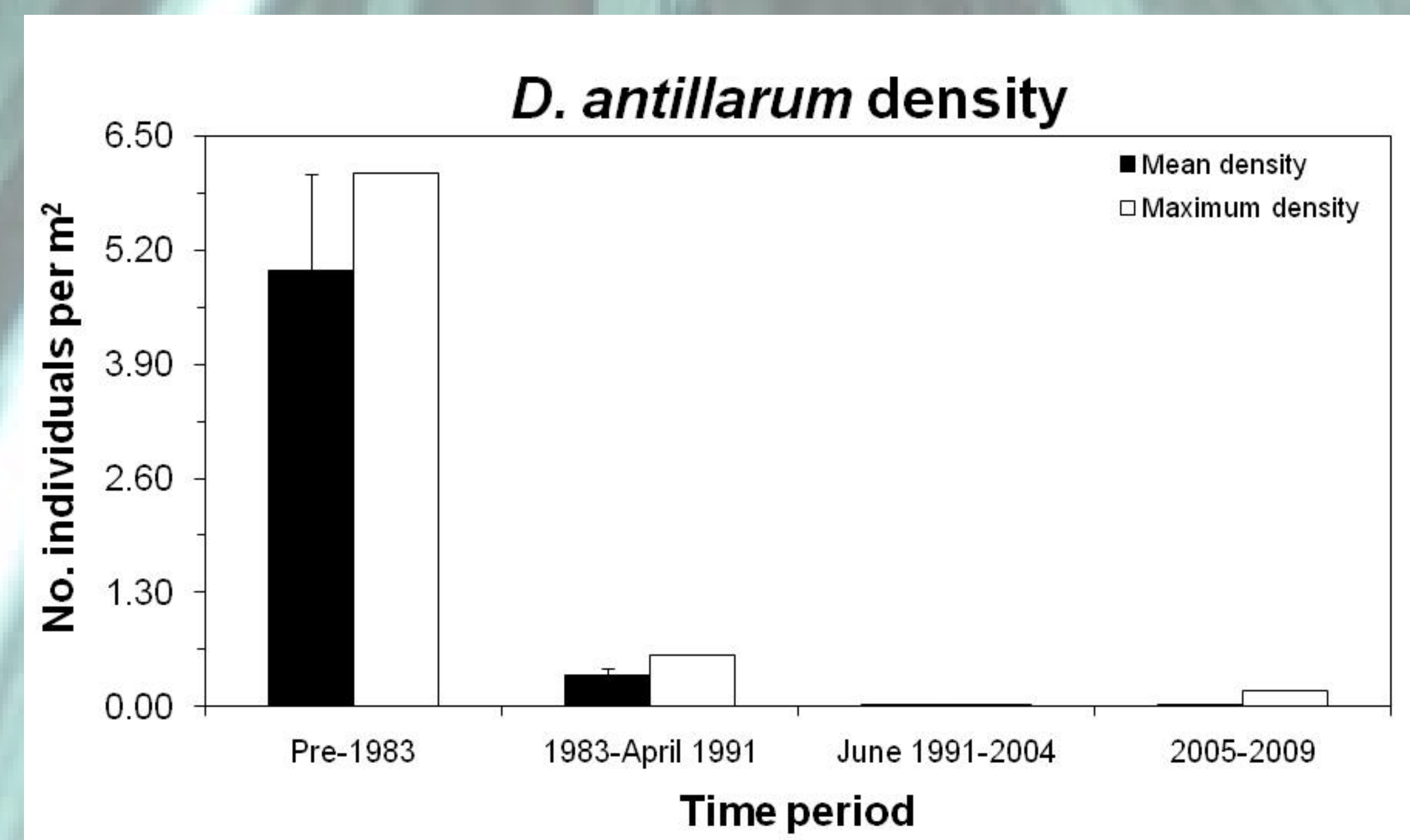
Historical distribution of *Diadema* surveys in the Keys



The high-relief spur and groove reef at Middle Sambo. Urchin surveys in 1972 were conducted on both the coralline spurs and sand grooves

Urchin Surveys, 1990-2009

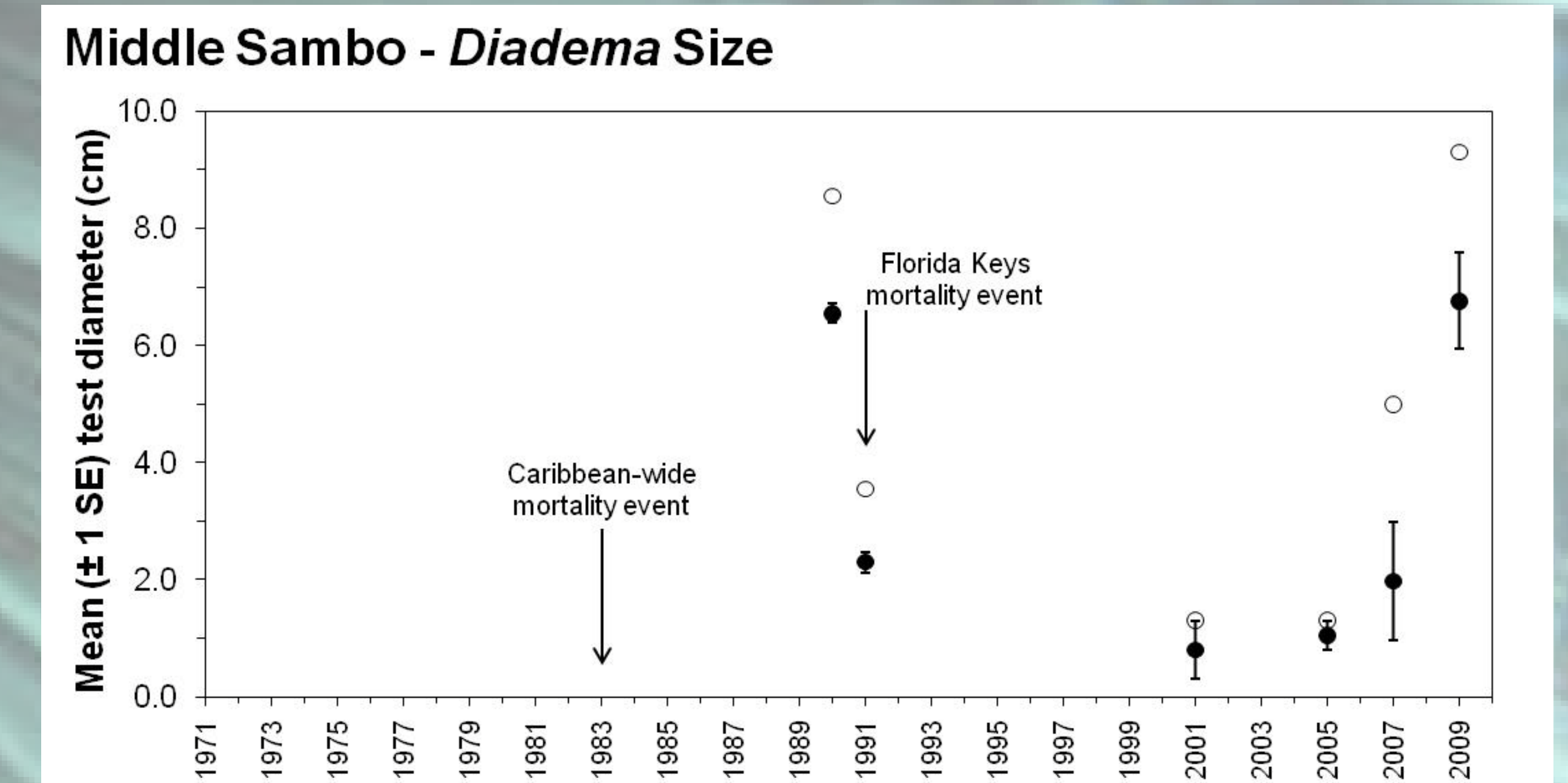
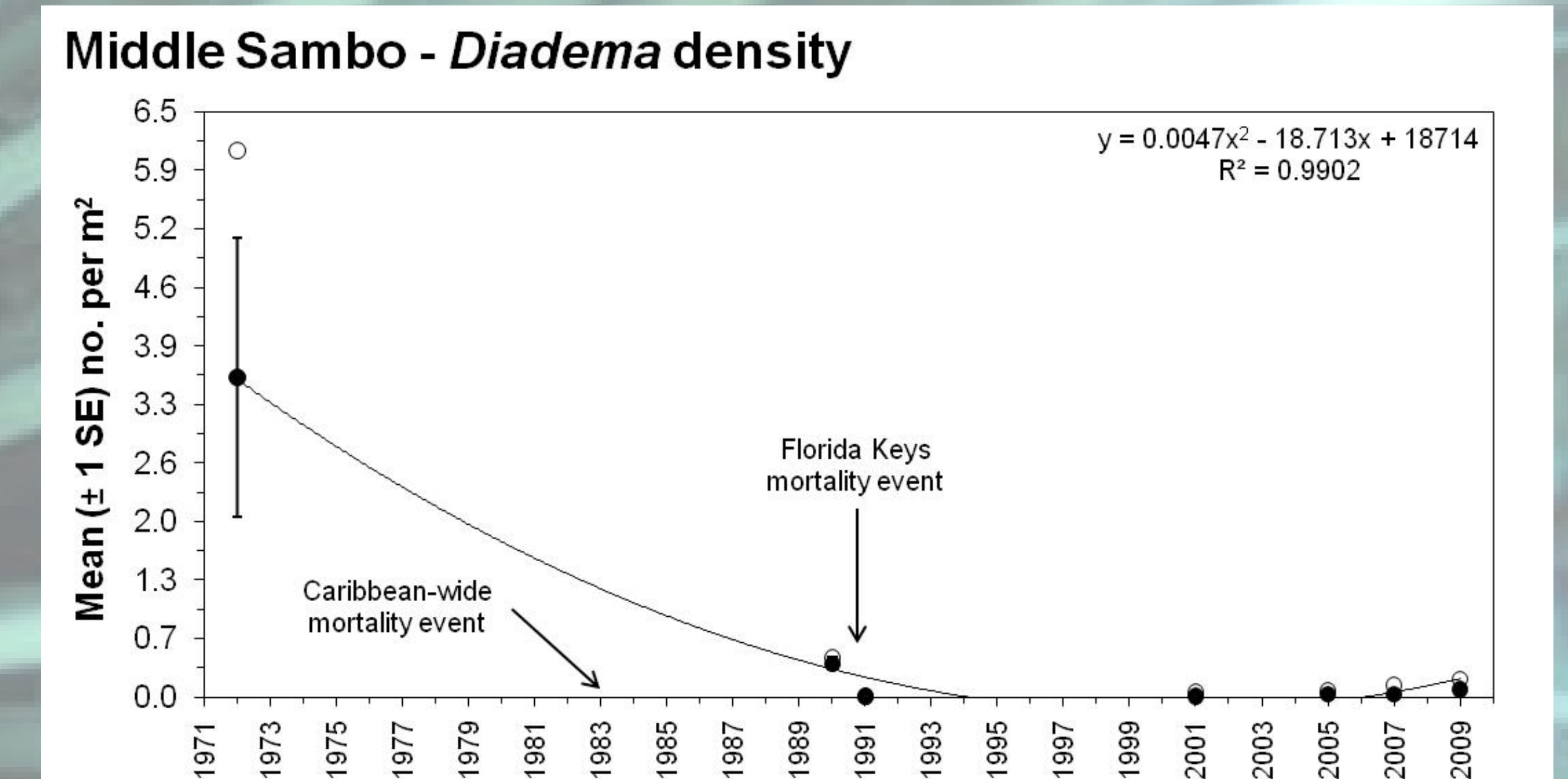
Forcucci (1994) conducted belt transect surveys of *Diadema* at several lower Keys reefs from late 1990 to June 1992. Large-scale surveys of urchin density and size were completed by UNCW during 1999-2009 at over 1,000 Florida Keys sites, including those sampled by Kissling (Chiappone et al. 2002). These data show initial recovery in density and size before the 1991 Keys-wide mortality, then slow recovery until about 2005-06. Since then, there has been a modest recovery in *Diadema* abundance and size.



Pooled mean and maximum *Diadema* densities for shallow (< 6 m) high-relief spur and groove reefs in the lower Keys over four time periods dating back to 1972.

Results and Conclusions

Kissling recorded *Diadema* densities as high as 6 individuals per m² in 1972. By the early 1990s, densities at the same reef were one-tenth this level, but apparently recovering from the 1983 mortality event before a second mortality event in April 1991. By 1992, *D. antillarum* densities were two orders of magnitude lower and remained so through 2009, although maximum sizes are increasing.



Temporal patterns in *Diadema* density (top) and size (bottom) at Middle Sambo Reef, 1972-2009. Filled circles = mean values, open circles = maximum values

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References

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- Chiappone et al. (2002) Mar Ecol Prog Ser 235: 117-126
- Forcucci (1994) Bull Mar Sci 54: 917-928
- Randall et al. (1964) Carib J Sci 4: 421-433