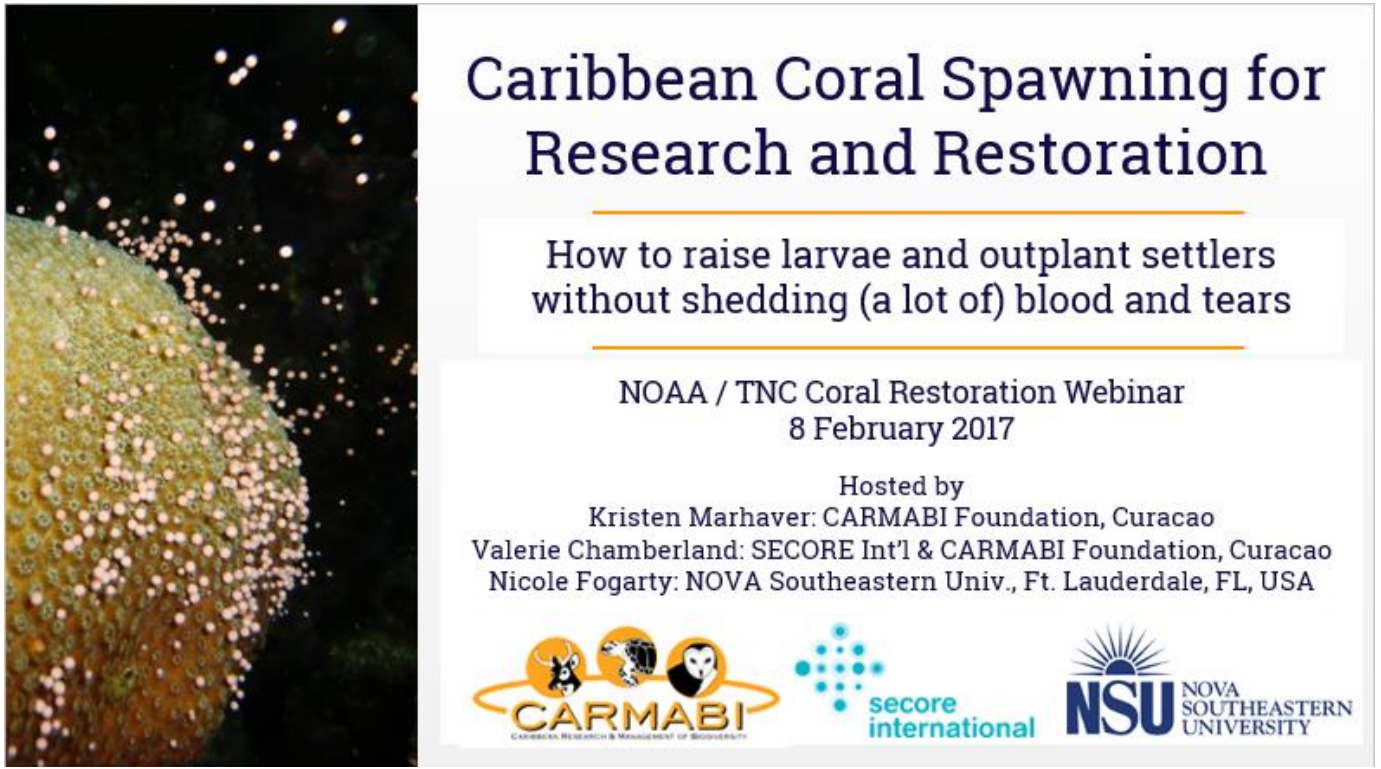
The following slides were extracted and adapted from the webinar *Caribbean Coral Spawning for Research and Restoration* prepared by Kristen Marhaver, Valérie Chamberland and Nicole Fogarty in February 2017. A full version of this webinar is available on the Coral Restoration Consortium's website at: http://crc.reefresilience.org/coral-spawning-research-larval-propagation/



# Observing & monitoring coral spawning

Photo credit: K. Marhaver

# Predicting the timing of spawning

MONTH

The month(s) during which corals spawn is dictated by the rate at which sea surface temperature increases

- Most coral species spawn between August and October

  NOTE: Spawning occurs about 1 month earlier in the northern Caribbean vs. the southern Caribbean

  - E.g., Florida *Orbicella* spawn in Aug and Sept, Curacao *Orbicella* spawn in Sept and Oct
  - Try to dive one month early and one month late, even if just to watch

DAY & TIME

The date and time at which corals spawn are dictated by the lunar cycle and sunset time, respectively.

- Most coral species spawn a few days following the full moon, for 2 to 3 days in a row
- Most coral species will spawn after sunset during a period of 30-120 minutes.

# Predicting the timing of spawning

To determine when coral spawning is likeliest:

- Refer to past observations *in your region* whenever possible
- Note month, date of full moon, and timing of sunset
- Use minutes past sunset, not time of day (daylight savings, full moon falls)
- Translate past observations to current year's moon cycle and your location's sunset times
- Use sun/moon data from your precise location, not global sun/moon times
- A good resource to track sunset time and lunar cycle is www.timeanddate.com
- Watch out for time zones and daylight savings time!
- Consult prediction tables for your region, available at http://crc.reefresilience.org/working-groups/scaling-up-larval-propagation/)

Dive as much as you can with the resources you have!

# Timing of spawning: Insider tricks

SPLIT SPAWNING

- When the full moon occurs very early or late in the typical spawning month, expect a split spawning across two separate months
  - E.g., in Curacao, in 2015, *C. natans* spawned in early October *and* early November

FULL MOON TIMING

- A full moon at 0200h on 2 Sept will *FEEL* like a full moon to the corals on the night of 1 Sept
- If the full moon occurs before ~0400h, we begin diving one day earlier

PREDICTABILITY IS GOING DOWN

- Warmer water can shift spawning earlier or cause split spawns; important to have as much as a “baseline” as possible
- Bleaching causes poor and less synchronized spawning the next year and in some cases for several years
- Smaller coral populations are worse at synchronizing spawning

AVOID HUBRIS: *A. palmata* can spawn on Day 1…or Day 11. Dive early & often!

# Night Diving

## DIVE LIGHTS

- Bigger isn't necessarily better
- Clips
- Always have a spare
- Glow sticks
- Don't blind buddy
- Signal buddy with light - make circles
- Headlights - wrist mount
- Dome lights for nets

## BOAT LIGHTS

- Running Lights/ Anchor Lights
- Tag line with light
- Light on dive flag

## NAVIGATION

- Transect
- Buoys
- Glow sticks

## GEAR

- Full wetsuit or skin
- Hood for warmth+ear protection from worms- Yuck!
- Streamlined gear
- Lights
- Compass

## DATA RECORDING

- Glow-in-the-dark slate
- Extra pencils
- Data sheets

# Setting/Staging

Before gametes are released in the water column, they are often visible while “setting/staging” in the mouth of each polyp. The setting/staging of gamete bundles can last from 0 to 30 minutes depending on species.

Photo credit: R. Riston-Williams

Photo credit: A. Wood

Setting/staging of gamete bundles by
*O. annularis* (Left) and *A. palmata* (Right)

# Hermaphroditic broadcast spawners


Photo credit: E. Hickerson

***Orbicella franksi***
SD: Aug 1–Oct 18; peak Aug 19–Sept 12
DAFM: 5–10; peak 6–8
MAS: 100–250; peak 110–200

Photo credit: K. Marhaver

***Orbicella annularis***
SD: Aug 1–Oct 30; Aug 26–Sept 21
DAFM: 5–8; peak 6–7
MAS: 150-275; peak 190-250

Photo credit: FGBNMS

***Orbicella faveolata***
SD: Aug 3–Oct 6; Aug 18–Sept 10
DAFM: 5–9; peak 6–8
MAS: 100–275; peak 175–250

**Note: SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**

# Hermaphroditic broadcast spawners

Photo credit: R. Ritson-Williams

***Acropora palmata***
SD: July 18–Sept 12; peak Aug 9–24
DAFM: 0–15; peak 3–6
MAS: 90–210; peak 140–190

Photo credit: R. Ritson-Williams

***Acropora cervicornis***
SD:July 21–Sept 3; peak Aug 6–Aug
20 DAFM: 1–15; peak: 2–6
MAS: 125–200; peak 150–190

**SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**

***The reprodutive timing of Acropora spp. is notoriously variable. Dive early and late to ensure you don't miss it.**

# Hermaphroditic broadcast spawners

Photo credit: Hickerson/FGBNMS

***Pseudodiploria strigosa***
SD: Aug 2–Oct 4; peak Aug 15–Sept 4
DAFM:5–8 ; peak 6–8
MAS: **-100**–320; peak 100–200

Photo credit: Muller & Vermeij 2011 Coral Reefs 30:1147

***Diploria labyrinthiformis***
SD: May–Nov; peak Aug 10–Sept 9
DAFM: 7–13 ; peak 10–12
**MBS**: 0–65; peak 15–45

Photo credit: FGBNMS

***Colpophyllia natans***
SD: Aug 8–Sept 6; peak Aug 16–31
DAFM: 7–10; peak 8–9
MAS: 38–170; peak 30–123

**SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**
**Note: D. labyrinthiformis spawns *before* sunset (MBS)**

# Gonochoric broadcast spawners

Photo credit: Neely et al. 2013 Coral Reefs 32: 813

***Dendrogyra cylindrus* - males**
SD: Aug 2–Sept 30; peak Aug 12–Sept 4
DAFM: 2–5; peak 2–4
MAS: 58–134; peak 93–119

Photo credit: Neely et al. 2013 Coral Reefs 32: 813

***Dendrogyra cylindrus* - females**
SD: Aug 2–Oct 1; peak Aug 12–Sept 4
DAFM: 1–4; peak 2–3
MAS: 58–142; peak 102–134

**SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**

# Gonochoric broadcast spawners


Photo credit: B. Holland

***Montastraea cavernosa* - males**
SD: Jul 19–Oct 4; peak Aug 13–Sept 3
DAFM: 4–9; peak 6–7
MAS: **-19**–259; peak 62–154

Photo credit: FGBNMS/Schmahl

***Montastraea cavernosa* - females**
SD: Jul 19–Oct 4; peak Aug 13–Sept 3
DAFM: 4–9; peak 6–7
MAS: **-9**–245; peak 62–147

**SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**
***Spawning range includes before sunset, depicted here as a negative number**

# Gonochoric broadcast spawners

Photo credit: B. Brown

***Siderastrea siderea* - males**
SD: Aug 1–Oct 5; peak Sept 10–Oct 2
DAFM: 5–7; peak 5–6
MAS: 217–226; peak 217–226

Photo credit: B. Mueller

***Siderastrea siderea* - females**
SD: Aug 1–Oct 5; peak Sept 10–Oct 2
DAFM: 5–7; peak 5–6
MAS: 210–231; peak 215–229

**SD = spawning dates; DAFM = days after full moon; MAS = minutes after sunset**

**We need your help to compile more data!**

# Timing of spawning: Please report!

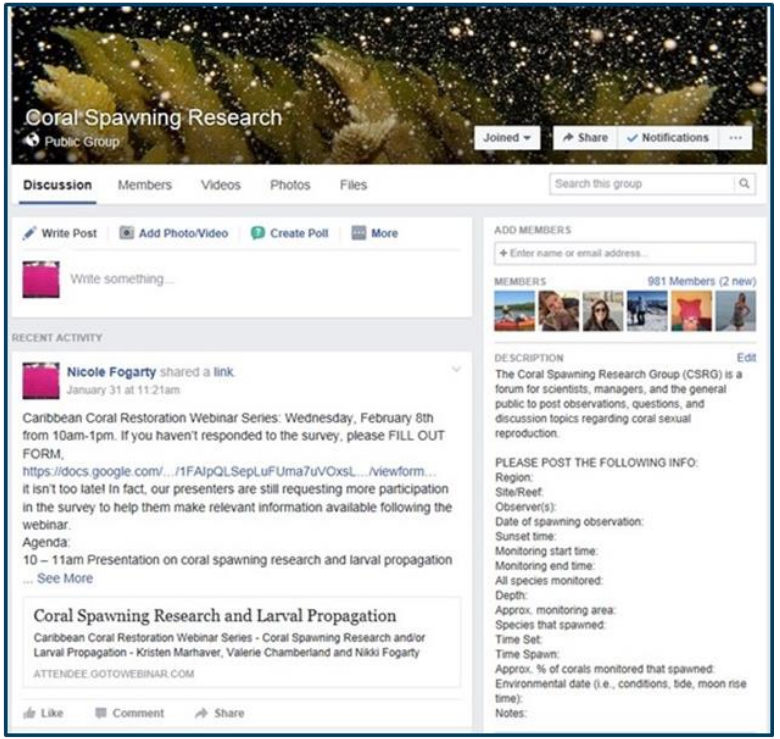
**Over a 1000 members!**

The Coral Spawning Research Group (CSRG) is a Facebook Group for scientists, managers, and the general public to post observations, questions, and discussion topics on coral sexual reproduction.

**PLEASE RECORD + SHARE THE FOLLOWING DETAILS OF YOUR SPAWNING OBSERVATIONS**

Region:

Site/Reef:
Observer(s):
Date of spawning observation:
Sunset time:
Monitoring start time:
Monitoring end time:
All species monitored:
Depth:
Approx. monitoring area:
Species that spawned:
Time Set:
Time Spawn:
Approx. % of corals monitored that spawned:
Environmental data (i.e., conditions, tide, moon rise time, wind speed):
Notes:



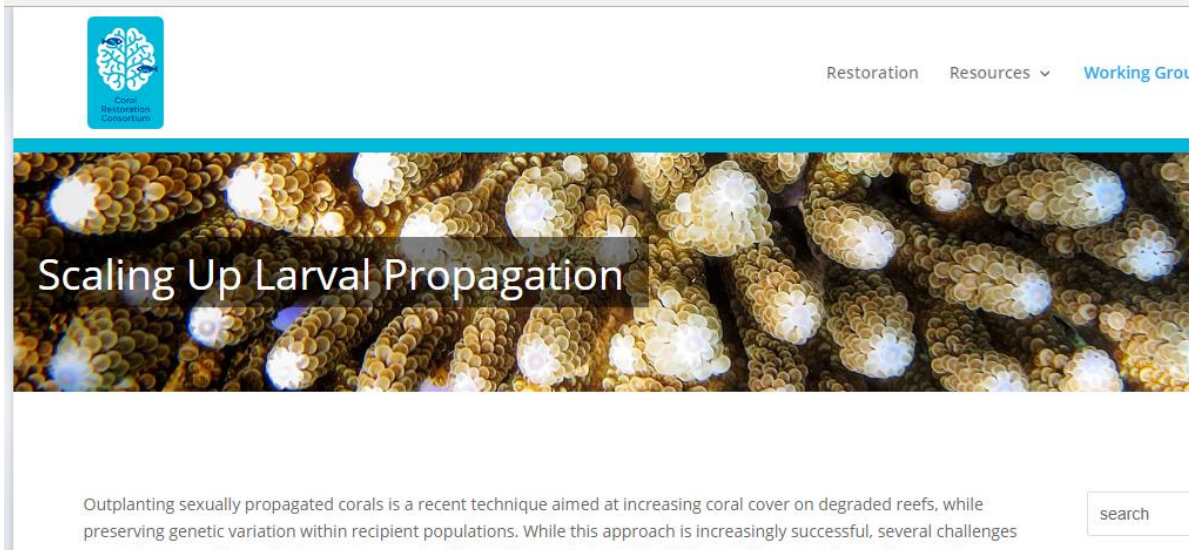
# Larval Propagation working group

The Coral Restoration Consortium's working group on Larval Propagation is seeking for extra pairs of eyes underwater during the upcoming coral spawning season to help monitor the reproductive activity of different coral species across the Caribbean. If you intend on observing coral spawning at your location, contact Valérie Chamberland at v.chamberland@secore.org and contribute to our knowledge on the reproductive biology of corals. This data is essential for us to aid the recovery of declining coral populations!

For more information about the Coral Restoration Consortium and the Larval Propagation working group, you can consult the following webpages:

Coral Restoration Consortium:
http://crc.reefresilience.org/

Larval Propagation WG:
http://crc.reefresilience.org/working-groups/scaling-up-larval-propagation/



# Timing of spawning: Please report!

The Coral Restoration Consortium's working group on Larval Propagation is currently compiling coral spawning data in a pre-set format. You can find this template at http://crc.reefresilience.org/working-groups/scaling-up-larval-propagation/ or email Valérie Chamberland at v.chamberland@secore.org

| Year | Month | Day | Number of days After Full Moon | Location | Site | GPS coordinates (latitude) | GPS coordinates (longitude) | Depth (in m) | Approximative area monitored (in m) | Observer | Sunset time (local time) | Start of monitoring (local time) | End of monitoring (local time) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | USE CTRL+D to fill down selected cells with 1st entry | | | | copy sheet in case more sheets are needed | | | | | | | | |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |
| 2018 | June | 7 | 9 | Curaçao | Holiday Beach Hotel | 12° 6'25"N | 68°56'51"W | 5-10 | 10 x 30 | Valérie Chamberland | 19:00 | 17:40 | 18:40 |

data entry sheet | options | guidelines

EADY