00:00
scientific seasons is environmental
00:05
monitoring compliance program that if
00:07
Rhonda and some of the others here on
00:10
the call of us started second to 2010 he
00:15
starts organizing for that and we're
00:19
monitoring increases in addition to
00:21
rockweed which is our focus today but we
00:23
have a total of nine CC and we have a
00:27
wonderful group of partners throughout
00:30
the state and actually nationally who
00:33
like self-knowledge E Network helped us
00:36
star data on folks in New Hampshire and
00:39
hip hop grant and Muni as well as Acadia
00:43
National Park acidic in fruits I mean
00:47
the council gardens main octagon and of
00:50
course um Maine Maritime Academy
00:52
all right back Beth I'm sorry to
00:55
interrupt folks you have to muse you
00:58
have to mute your phone and you have to
01:01
mute your little microphone icon it's on
01:06
your GoToMeeting control panel we are
01:09
recording this so many other people who
01:12
wanted to be honest today can hear this

01:14
so I would be really great if you could
01:17
I see three people that need to mute
01:21
themselves either on their phone or on
01:25
their the computer little green
01:28
microphone icon thank you
01:32
sorry Beth
01:34
no problem thanks Rhonda and also the US
01:37
Fish and Wildlife Service and will Jesse
01:40
will be sharing some great information
01:42
about for research I just wanted to
01:43
orient everybody to what we're doing in
01:46
the program and how volunteers are
01:48
involved so as some of you probably know
01:51
already but phenology is not a common
01:55
word it's the study of the timing of
01:58
plant and animal life cycle events so
02:00
everything from migration to leaf out
02:04
and flowering of plants as well as
02:07
reproductive activity and in
02:11
metamorphosis you see the the monarch
02:13
butterfly chrysalis there as well
02:16
lilac flowers and American toad and then
02:19
of course that so the picture on the

02:22
bottom left are receptacles reproductive
02:26
receptacles from the ESCO film the
02:27
docent plant which is commonly called
02:29
rockweed and these are all things that
02:32
are easy to notice and in record but a
02:38
big impetus behind this new effort
02:41
globally really of tracking and
02:44
monitoring phenology to help with
02:46
climate change research was in the
02:50
during the intergovernmental panel
02:52
meetings on climate change in 2007
02:55
phonology was formally identified as the
02:59
simplest process in which to track
03:00
changes in that ecology of species in
03:02
response to climate change these changes
03:05
are happening all around us all the time
03:07
and you know we can see Robins building
03:09
nests we can see you tree leafing out
03:12
and by recording and monitoring those
03:15
those very local scale changes we can
03:18
help ground troops climate models
03:21
because and make them really more useful
03:24
at the local scale and so so each of our

03:29
different species has different
03:30
characteristics phonology fino phases
03:33
they're called changes that we're
03:35
observing and for rockweed because it's
03:37
not you know a plant or an animal really
03:40
we have different procedures for
03:43
monitoring Rockley than for our other
03:44
species and the
03:47
nation as Jesse will share is going
03:49
straight into her research but I'll just
03:52
run through what it is we're doing on
03:54
scene so those of you who are not
03:56
involved have a better sense so we're
03:59
looking at the scene of face changes
04:00
which I'll share a bit more about in a
04:02
moment we're collecting temperature and
04:06
salinity and the areas where we're doing
04:09
our monitoring and then we're also
04:10
collecting age and growth measurements
04:13
of of individuals within rockweed stands
04:17
were at our site and so roughly you know
04:21
until I got involved in this I wasn't
04:23
closely observing these changes myself

04:26
but since then of course I've become
04:29
much more attuned to these changes over
04:31
time and it really through an annual
04:33
cycle you see drastic changes in these
04:35
reproductive receptacles what they look
04:38
like and whether or not they're even
04:40
present um and so you see across the top
04:43
and our first female phase observations
04:46
on the upper left you see where their
04:50
new side growth in areas where the
04:53
receptacles will grow and then they came
04:56
in from being smooth and flat to inflate
04:59
it and then sort of dotted and what we
05:01
call Dada's and play which is rough and
05:03
then once they've released their gametes
05:06
they're torn and eventually they drop
05:08
off and then I apologies for the side
05:10
view here this is a car that we print
05:14
out for our volunteers to use in the
05:16
field but rockweed similar to the way
05:18
trees have growth rings they they form
05:23
air bladders on the main stem stems each
05:27
year and so you can actually count those

05:30
to get a rough estimation of age and
05:33
measure the distance between them from
05:36
year to year to understand the growth
05:38
rate of any given stand of rockwheat on
05:40
average and then here's this is I won't
05:45
bother going through all of this but
05:46
this is a car that we hand out to help
05:49
our volunteers who are monitoring water
05:51
temperature because the reproductive
05:54
changes are cued by water changes rising
05:58
water temperature in the spring
06:00
then we also collect salinity data to
06:02
understand how freshwater inputs and
06:04
other aspects from one location to
06:07
another are changing with the water
06:09
salinity our our volunteers put their
06:14
collector data in the field and then use
06:16
our website this is a screenshot of our
06:18
website and there are different data
06:20
sheets where they go in and enter their
06:23
data and then Jesse uses it to inform
06:27
her research and so that's just a quick
06:30
overview our website is there at the top

06:32
of the page and then this is a couple
06:34
photos some of you who are on the call
06:36
today of our wonderful volunteers and
06:39
then our names myself and Esperanza Pro
06:43
coordinator Sarah Randall's on the call
06:45
with our assistant coordinator and
06:46
Kristina visca who's our summer intern
06:49
current language size machinist and so
06:51
with that I will turn it back over to
06:53
Esperanza and Jesse thanks pass um I
06:59
just wanted to quickly introduce again
07:03
Jesse mule in dr. Jesse mule and she's
07:06
an advisor to our program
07:08
she's been really instrumental in our
07:12
development of our protocol our
07:14
resources to volunteer observers data
07:17
management and analysis and so forth so
07:19
we're really happy to have you today
07:21
Jesse great well thank you thank you
07:24
very much and it's really a pleasure to
07:25
talk about rockweed and have everyone
07:29
who is on the call now as well to come
07:32
might view this in the future to have

07:34
interest in rockweed and the main signs
07:36
of seasons program because it really is
07:38
a great way to get involved and collect
07:41
data that can be used to inform some
07:44
really interesting science or I think so
07:50
three so I thought I would give a brief
07:55
introduction in terms of what rockweed
07:57
is because it's a common name that
07:58
actually encompasses a number of
08:00
different seaweeds so Rock weeds kind of
08:04
encompass all of what we call too coid
08:06
macroalgae
08:07
so these are sea weeds that are
08:09
intertidal and there lissa fights
08:12
meaning that they're Brock loving they
08:13
need a heart
08:14
and substrate to to attach to and to
08:17
grow so if you in have if you go to
08:20
sandy beaches you wouldn't really find
08:22
rock weeds because that substrate is
08:24
moving too much and that those
08:26
individuals can't attach them and grow
08:29
up over time within the Gulf of Maine

08:32
and kind of the North Atlantic there are
08:33
two dominant rock weeds the first one is
08:37
you Kazuki losest which is much shorter
08:40
in stature and often found in more areas
08:44
of higher water motion and the species
08:47
that that most people think about when
08:50
they hear rock weight is a skiff elem
08:52
nodosum it's often much larger in
08:55
stature and is found in more sheltered
08:58
and Ament it has a variety actually a
09:01
lot of common names including Norwegian
09:04
kelp knotted rack knob track ASCO and
09:07
egg rack and so you can kind of see that
09:09
there are some similarities and
09:11
differences in terms of looking at
09:12
cheapest versus Aska filaments so one of
09:15
the first things is just to kind of
09:17
acquaint yourself with when talking
09:19
about rock weed are you talking about
09:20
few gifts are you talking about asked to
09:22
fill them and that both have air
09:24
bladders and when their reproductive
09:26
they both have receptacles and all kind

09:28
of delineate those two for un of them a
09:31
little bit so it's always very helpful
09:36
to have a common vocabulary when talking
09:38
about seaweeds most people don't learn
09:42
about the algae collectively and so we
09:45
like to kind of give analogies to other
09:47
organisms what we might know more about
09:49
or have learned about so oftentimes sea
09:52
beads are the analogy is to plants and
09:56
so I want to just kind of clear up some
09:59
perceived misconceptions that rob weed
10:02
is not a plant so it doesn't have a root
10:05
system or a vascular system it is
10:07
photosynthetic but it if I use the word
10:12
plant I don't really mean it in terms of
10:14
the word plan I mean as an individual
10:16
and so rockweed attaches to a hard
10:22
substrate and that's the very bottom of
10:25
this diagram you'll see it where the
10:27
holdfast
10:29
so it attaches by a holdfast and then it
10:32
starts to grow and it grows ethically
10:35
meaning that it grows from a tip up and

10:38
so you can kind of see on the upper
10:39
left-hand corner a little arrow that
10:42
points to the apical tick of the frond
10:45
and so that's where the newest growth is
10:47
always going to be rockweed has these
10:51
air bladders that after about two years
10:53
of age they start to lay down an air
10:56
bladder for every new growing season and
11:00
so you can actually count those air
11:01
bladders to get a relative age for each
11:04
individual and then another thing that
11:08
often is confused with an air bladder is
11:11
the reproductive organ which is called a
11:14
receptacle and those are when they're
11:17
present on the individuals are found
11:19
laterally across the the frond or the
11:22
phallus and if you look in the lower
11:26
right-hand panel of pictures you can see
11:29
a kind of blue circle that's identifying
11:32
those receptacles the little line that's
11:34
kind of trying to indicate a
11:36
cross-section so if you took a
11:38
receptacle and you have a little razor

11:41
blade and you could kind of make a dice
11:44
cross-section of it what you would see
11:47
underneath the microscope either a
11:50
dissecting microscope or a compound
11:52
light microscope would be inside that
11:55
receptacle these cross sections that you
11:57
see on that the left-hand panel of that
11:59
picture males have these flask shaped
12:04
and females do two of these concept
12:06
goals inside the receptacles and for
12:08
males they have packets of sperm that
12:11
are stored in structures called
12:13
antheridia and females have packets of
12:17
eggs that are stored in structures
12:18
called a Gonia and they look different
12:21
underneath the microscope males are
12:24
bright orange in terms of their
12:25
antheridia the sperm have a carotenoid
12:28
pigment so it senses light and so if you
12:32
were able to look at it it would really
12:34
look like a very bright bright orange
12:36
and females are an olive green and
12:40
coloration

12:44
Aska Solem in general has a tremendous
12:48
amount of structure both at low tide and
12:50
at the flood tide and at high tide and
12:53
so I hope that these two photographs
12:55
kind of emphasize that the structure is
12:57
present no matter what the tide is doing
13:00
in that a lot of the mid intertidal zone
13:04
is covered quite extensively with Eska
13:08
phil and individuals and so at low tide
13:11
they they kind of lie on the intertidal
13:15
substrate and they provide a tremendous
13:18
amount of habitat and desiccation
13:21
tolerance for lots of other organisms
13:24
that are living on or beneath them
13:26
during the low tide and as the tide
13:29
comes in the air bladders of the basket
13:33
fill and individuals allow it to become
13:36
much more bland and so that flood tide
13:39
and ebb high tide you can see that
13:42
there's a tremendous amount of
13:43
three-dimensional structure that a ski
13:45
film provides in the nearshore
13:48
environment and so because of its

13:53
dominance in the main intertidal zone
13:55
and also the amount of physical
13:57
structure presents in the intertidal
13:59
zone rock waves are really ecologic ly
14:01
important
14:02
there are perennial species so they live
14:06
for many years they're foundational
14:09
meaning that once you have an asked to
14:12
fill an individual that establishes
14:14
itself and a population grows up over
14:16
time it changes the physical and
14:20
chemical parameters of that intertidal
14:22
zone and allows for a lot more biota to
14:26
be present and thrive as well as ask a
14:29
poem is a primary producer
14:30
so it's fixing carbon dioxide it is
14:34
releasing oxygen as a byproduct of
14:36
photosynthesis when it gets detached or
14:40
diseases and it goes through the Detroit
14:43
a pathway it's really important in terms
14:45
of nutrient cycling one thing to kind of
14:48
keep in mind in terms of thinking about
14:50
ask a philan is that there is a

14:51
tremendous amount of variability
14:54
to film across the the coastal
14:58
populations and so what active film
15:02
looks like in southern Maine can be very
15:05
different with what a film looks like in
15:07
terms of its structure in let's say
15:11
comic book day and so there is lots of
15:14
variability in one of the wonderful
15:16
things about signs of the seasons is
15:18
that observers are able to kind of
15:19
observe all those differences and be
15:21
able to record those data and share them
15:23
and so that we're able to get a really
15:25
nice large spatial understanding of all
15:29
of that variability and the other thing
15:32
to kind of keep in mind is that the
15:34
natural world is really not static and
15:36
so the timing of reproduction for ask a
15:39
film is really a great tool to be able
15:43
to see that things are really dynamic
15:44
and that this species really responds to
15:47
changes in the physical environment and
15:51
the chemical environment and that it's

15:54
really a wonderful indicator species for
15:57
changes in climate so one example in
16:01
terms of just thinking about the
16:02
variability of different populations is
16:05
just looking at receptacle size at three
16:09
different locations in 2014
16:11
there's even among the individuals at
16:14
each of those sites at Utica and in
16:16
Machias and it harps well you can see
16:18
that the coloration the amount of
16:20
epiphytes or other algae that are
16:22
growing on top of it are all really
16:26
different so the location in which a
16:32
schism persists is really this amazing
16:35
interface of a tremendous amount of
16:38
physical and chemical and biological
16:41
forces and so I thought I'd kind of
16:43
entertain the idea of how how dynamic
16:46
that intertidal zone is in terms of the
16:49
physical and chemical forces and if you
16:51
look at this it's kind of you can think
16:54
of it as either the tides going out or
16:56
the tide coming in and that that band of

16:59
rockwheat is being exposed and and that
17:03
high tide to the water is going to be
17:05
completely submerging those
17:08
seaweeds and at low tide they're going
17:10
to be completely exposed and so if you
17:13
think about all those physical and
17:16
chemical forces there's changes in light
17:19
quality and light quantity as the water
17:21
comes up over the individuals those
17:26
changes in nutrients that are available
17:27
for photosynthesis and other metabolic
17:29
pathways there's lots of temperature
17:33
stress the intertidal zone experiences
17:36
hot summers and really cold winters as
17:39
well as desiccation in terms of being
17:41
exposed or immersed in water osmotic
17:45
shock in terms of the differences
17:47
between salt water and fresh waters you
17:50
can imagine that individuals at low
17:53
tides during rainstorms like the one we
17:55
might have had today really change the
17:58
water dynamics that might be available
18:02
to the Seabees as well as mechanical jet

18:05
damage so the force of waves and the
18:08
drag that each individual has as the
18:12
wave is pulling it back as well as in
18:15
the Gulf of Maine that we have lots of
18:18
ice during the winter and so ice scour
18:20
is also another mechanism for mechanical
18:23
damage that these seeds have to endure
18:27
as well is not just chemical and
18:29
physical factors but biological factors
18:32
as well so most common in terms of
18:35
thinking about the ecology within rocky
18:38
intertidal habitats is competition for
18:42
space so overgrowth from other algae and
18:45
then predation in terms of our beverage
18:48
so lots of intertidal fauna like snails
18:53
and limpets that like to graze and eat
18:57
small episome zygotes or babies as well
19:02
as graze on or upon the adult or
19:05
juvenile individuals one thing to also
19:11
keep in mind although I would prefer
19:12
that we don't really talk about the
19:15
implications for it is the basket film
19:18
is a commercially harvested

19:19
did seaweed in Maine it's been harvested
19:22
for centuries in the North Atlantic and
19:24
that it has a lot of wonderful
19:26
characteristics and qualities that are
19:28
used as a brain resource so my specific
19:34
interest in research with few koi algae
19:38
is looking at reproduction and so we
19:41
know that rockweed reproduction is
19:43
influenced by a number of physical and
19:46
chemical factors and that rock waves in
19:49
general share these reproductive
19:52
ecological systems with other marine
19:56
organisms so including corals and
19:59
urgence in which all of these species
20:01
have external fertilization meaning that
20:04
they release their eggs and sperm into
20:06
the water column and reproduction takes
20:08
place external from an individual
20:12
depending on the species species can
20:15
either have just beat male or just be
20:18
female or it can be from a predict
20:21
meaning that it has both male and female
20:24
reproductive components and for us a few

20:29
lumps it is what we call a dioecious
20:31
individual it has separate male and
20:34
female individuals and so you can see on
20:37
the figure on the left that is a female
20:40
it's got these all of green who go Mia
20:44
that are releasing from those
20:47
susceptible pores and that you then have
20:51
these bright orange and Cydia for the
20:53
males on the right and so if it's really
20:57
same you can see the difference between
20:58
males and females and generally speaking
21:01
the sex ratio within any particular
21:03
population is 50/50 the amount of
21:09
reproduction that Aska filum has is
21:12
quite amazing I think so this is just an
21:16
example of the amount of reproduction
21:18
that any one individual might have or we
21:21
call reproductive allocation and this
21:24
does vary both in space and in time
21:27
so for this example in 2014 I had my
21:31
student Sara Brochu who is in this
21:33
photograph year collect five male and
21:36
five female individuals and then I had

21:40
her take all of the receptacles off each
21:43
individuals and count them and then we
21:46
dried both the receptacles and the
21:49
vegetative matter the things that were
21:51
not reproductive of every single
21:53
individual to get the percent of the
21:57
overall biomass wet dry biomass that was
22:01
allocated toward reproduction and you
22:03
can see in terms of thinking about mean
22:05
number of receptacles on that graph
22:07
that's the panel on the left that that
22:11
there are hundreds if not thousands of
22:14
receptacles for every single individual
22:17
and so every single receptacle has
22:20
multiple concept goals within it and
22:22
within every single concept achill there
22:25
are heaps and heaps of antheridia that
22:28
have many many millions of sperm or eggs
22:31
so the amount of reproductive output is
22:35
really tremendous for this particular
22:37
species and then thinking about the
22:39
reproductive allocation just looking at
22:41
dry weight nearly twenty percent of the

22:45
overall biomass during the reproductive
22:47
season is allocated towards reproduction
22:50
so that is a tremendous amount of energy
22:52
that is towards the effort of
22:54
reproducing for the next generation and
22:58
so that because I'm so interested in the
23:02
reproductive ecology the phenology is
23:04
also really important so not just how
23:07
many receptacles but when those
23:09
receptacles are present and the timing
23:13
of that maturation of the receptacles
23:15
and when eggs and sperm are released is
23:18
a real important Channel and I'll
23:21
hopefully to allow you to see kind of
23:23
implications of the repercussions of
23:25
that repressive initiation and gamete
23:29
release so what we know is that the
23:33
timing that is associated with photo
23:35
period the amount of daylight and also
23:38
sea surface temperature so the water
23:40
temperature and in general although it
23:44
will also vary in time and in
23:46
face the maturation time and the takes

23:51
place in the winter and early spring and
23:54
that the gamete release occurs in April
23:56
in May in June the receptacles start to
24:00
get torn and they are shed and then the
24:04
new growth and kind of initiation takes
24:08
place in July and through the and so
24:14
because rockweed is known to entrain its
24:20
reproductive ecology with photo period
24:22
but also most importantly with sea
24:24
surface temperature changes in climate
24:27
can really influence changes in the
24:29
reproduction of these raw foods so the
24:33
kind of the seminal paper that is the
24:36
foundation of this research was by bacon
24:39
and vadas in 1991 and what they did also
24:42
excites in maine was that they saw that
24:45
there was a span of time between three
24:47
and seven weeks in the spring that asked
24:50
if someone was reproductive and that
24:52
through very detailed sampling that six
24:59
degrees celsius was the onset of gamete
25:01
release ten degrees celsius was at the
25:04
midpoint of the percent tube damn it

25:06
release it took place at 50 percent and
25:08
that at 15 degrees Celsius it was really
25:11
the termination of gamete release and so
25:13
that really became the baseline for a
25:15
lot of the phonological data that I
25:19
started to acquire and that have help
25:23
from main signs of the seasons masculine
25:26
observers the other thing to kind of
25:29
keep note is that if water temperature
25:32
is the the primary indicator in terms of
25:35
when reproduction occurs that within the
25:39
Gulf of Maine we're really seeing a
25:42
significant trend of increasing sea
25:45
surface temperatures and so this graph
25:47
shows you long-term temperature trends
25:51
for one buoy within the Gulf of Maine in
25:53
the North the new england ocean
25:55
observing system buoy said and what you
25:58
can see and hopefully the
26:00
you identify that there is a trend from
26:03
when the data started to be acquired
26:04
until now that the the sea surface
26:08
temperature is increasing over time and

26:11
that within the last 12 years there has
26:15
really been a market increase in terms
26:18
of much warmer temperatures experienced
26:20
in gulf of maine and so the idea is that
26:25
with increasing sea surface temperatures
26:28
there could be shifts in the
26:29
reproductive tiny masca film and that
26:33
one of the research questions I have is
26:35
that how important is stir plus eggs and
26:39
sperm and zygotes choosing your shore
26:42
environment again its externally
26:44
released so I kind of think of eggs and
26:47
sperm and fertilized eggs which is I go
26:50
being really important nutrients or
26:52
particles for other intertidal organisms
26:55
that might rely on them as a nutrient
26:58
source energy source over time and that
27:01
if indeed they are important that if you
27:04
have shifts and climate that produce
27:07
shifts in reproductive timing that there
27:10
could be a trophic implication for that
27:12
so that if you have a snail that is
27:14
dependent on oxygen reproducing in the

27:17
spring and that snail is over time
27:22
adapted to be ready to acquire that
27:26
material in May and the sea surface
27:30
temperatures are warming so that task
27:32
film is shifting its reproductive timing
27:35
to let's say April those kind of trophic
27:38
implications might bear out so this is
27:41
one research project that many times the
27:44
seasons has really helped in terms of
27:47
increasing and supplementing some of the
27:49
data that I'm trying to collect to see
27:51
shifts in reproductive timing over a
27:54
number of different locations over a
27:57
number of different years and so one
28:01
thing we did starting in 2014 was to put
28:06
out temperature data loggers so these
28:09
were deployed in the winter and early
28:11
spring and could record
28:13
the temperature every 15 minutes and the
28:16
idea was we could then compare the
28:18
temperature and then the state of the
28:21
release of gametes with the bacon
28:24
goddess 1991 literature MC is their

28:27
similarity or difference in terms of
28:29
timing when the bacon and bodice
28:32
research was going on they didn't have
28:34
fancy data loggers they just used the
28:37
stem thermometer at high tide and they
28:41
took an instantaneous measurement so
28:43
that these data loggers provide more
28:45
precision in terms of thinking about the
28:47
temperature within the field and then
28:52
what we also did was refine kind of what
28:55
look what the gametes were doing inside
28:57
the receptacles and so we created an
29:00
index that kind of allowed us to assess
29:04
what what the gametes were doing in
29:07
terms of maturation of the eggs and
29:08
sperm and then release of those
29:10
antheridia and Gonia over time and we
29:13
also use the signs of the seasons data
29:15
to kind of also see the changes over
29:18
time so the signs of the seasons data
29:20
isn't as invasive in terms of doing
29:24
cross sections and looking underneath
29:26
the microscope but purpo provides a

29:29
tremendous amount of overall female
29:32
phase differences at each different
29:34
location and over a number of different
29:36
years in addition we completed a number
29:42
of field studies over two years to
29:44
identify the intertidal animal that
29:48
might utilize that surplus reproductive
29:51
material from both aspects element also
29:53
Fuca specific psious so we had three
29:56
sites across the coast that we sampled
29:59
extensively in the spring summer and the
30:03
fall
30:04
come on we were trying to do is be able
30:07
to collect all of the macroscopic
30:10
invertebrates and then using a technique
30:14
called stable isotopes resolve food web
30:17
dynamics and be able to see what might
30:20
be eating different things in the
30:21
intertidal zones and whether or not a
30:24
special and reproductive material is an
30:27
component of any of those intertidal
30:29
organisms diet we also did a number of
30:36
small laboratory experiments using seed

30:38
muscles up at the Downeast Institute in
30:40
on Beals Island so these are just some
30:43
figures looking at the release of eggs
30:46
and sperm artificially and then feeding
30:50
those to itty-bitty little muscle babies
30:52
in the in the laboratory and so the data
30:59
are really interesting and that we're
31:01
seeing that there are patterns of
31:03
variability and so this is a chock full
31:05
slide that shows you on the left-hand
31:09
side two sites that signs of the seasons
31:13
observers from collected over three
31:15
years where you can see that over the
31:19
course of time so on the top axis you
31:24
have the months so April May June July
31:27
and August that kind of the primary time
31:30
when asked if Elmo's reproductive and
31:32
then what those female phases are are
31:34
the different colored bars that you can
31:36
see and so what you can see is that
31:39
there's a lot of variability and so I'm
31:41
thinking about changes in climate you
31:44
really need to have a number of years to

31:45
be able to look at trends and we're
31:49
getting there in terms of having more
31:50
than one location and more than just one
31:54
year to be able to them see patterns and
31:59
also you can see on the right hand
32:01
panels the original bacon and Vadis data
32:05
showing kind of the onset the midpoint
32:07
and the termination of gamete release
32:10
and then the data that we collected
32:13
showing the onset the midpoint and the
32:16
termination of gamy release and so the
32:20
the the data are not as exact but they
32:26
really help provide fill in and
32:28
understanding in terms of how
32:30
temperature really does influence the
32:33
reproductive timing and so the hope is
32:36
that in time if there are contained
32:40
changes in sea surface temperature that
32:43
we would see this reflected in the
32:45
appearance and the duration about film
32:48
FINA phases and it can really be a
32:50
wonderful indicator in terms of seeing
32:53
changes over time and then also thinking

32:56
about the differences that might exist
33:00
across the the trophic food web of
33:04
organisms them might rely on the
33:07
reproductive material that ask if film
33:09
provides and then the second research
33:14
project that includes signs of the
33:17
seasons volunteers is a recent project
33:21
that was started this past fall and it's
33:24
looking at Ascalon population structure
33:26
in coastal Maine now this project the
33:30
lead scientist is Susan Brawley at the
33:32
University of Maine and includes a
33:34
number of researchers across the state
33:37
and also includes one researcher in
33:39
Atlantic Canada and the idea for this is
33:43
to be able to understand long-term field
33:46
site data that looks at both sheltered
33:52
and exposed locations that those
33:55
locations either experienced harvest
33:58
high levels of mechanical damage in
34:02
terms of wave force and both include
34:06
rocky intertidal zones and soft sediment
34:08
habitats and this is also to help kind

34:12
of seed that variability and understand
34:15
that variability of growth rates and age
34:17
structure and density of individuals at
34:20
each of those locations and so the signs
34:22
of the seasons data also helps in terms
34:25
of thinking about that protocol see in
34:27
terms of thinking about the age and the
34:29
growth rates of populations that finds
34:33
the seasons observers might also be
34:35
collecting and so I selected a site and
34:42
started a site that's in harps domain
34:45
and most of the other researchers use
34:48
students in their courses and I tried
34:52
using citizen scientists
34:54
tapping into some of our masks Asylum
34:57
observers to help in the field and I
35:00
would really say that signs of the
35:01
seasons volunteers are fabulous field
35:04
research assistants they have knowledge
35:07
of the ASCO film they have interest they
35:11
are already really acquainted with that
35:14
habitat and they are I would say much
35:18
better than the undergraduates who might

35:20
be required to come to a lab and collect
35:23
data that the sons the seasoned
35:26
observers are wonderful wonderful about
35:28
it so if you are an observer or interest
35:31
in observing or you've listened to this
35:33
webinar and you're interested in
35:35
participating in this research please
35:37
let Esperanza or best know we're going
35:40
to be sampling again in the fall
35:42
probably in October we would love to
35:45
have other citizen scientists come out
35:48
into the field and help us collect the
35:50
data it's going to be a long-term
35:52
project
35:54
preliminary in terms of thinking about
35:57
the data that we are acquiring there are
35:59
three sites that were baseline
36:02
information was collected over this past
36:05
fall and so they were at ten acquit
36:07
point that Harpswell and on Sears Island
36:10
and what you can see is that again
36:12
and there is similarities and
36:13
differences in terms of the length of

36:16
the Aska filum individuals and the age
36:19
of the sk film that's found there and so
36:22
we're very excited in terms of
36:25
continuing this research and collecting
36:28
more data to see trends over time so
36:32
with that I'd be happy to answer any
36:35
questions and I really thank you for
36:37
your attention
36:40
Thank You Jesse this and it was
36:43
incredible it was really great very
36:45
informative so you can type your your
36:48
questions into the chat box on your
36:52
panel there so I had a question going
36:59
back to why we're waiting for people to
37:03
type their questions in to the research
37:07
that the first research project and can
37:12
can you go back a few slides Jessie - ah
37:18
wait a minute stop so what what what did
37:25
you what did you note about I justified
37:30
the animals that are you able to detect
37:34
the the bivalve
37:37
larvae they replied classify them and in
37:41
your samples or no in terms of the

37:46
bivalves larvae no so in the the work up
37:51
at the Downeast institute those blue
37:57
mussels for about one to two millimeters
38:00
in size and they were seed muscles that
38:02
were cultivated there so we didn't we
38:05
didn't collect them in the field of it
38:06
and take them back right right okay
38:08
great thank you so susan DiMucci has
38:12
asked regarding research project number
38:15
two does the soft sediment habitat
38:17
support after film growth that's a good
38:21
question so I would say that soft
38:24
sediments in general don't support
38:26
Africa film establishment or growth but
38:29
within soft sediment areas there's often
38:32
kind of cobbles or boulders or kind of
38:35
eroding softer substrate that asketh
38:40
film can attach to and grow over time
38:42
the difference is and the growth may not
38:46
have to do with the soft sediment but in
38:48
terms of thinking about water motion and
38:50
so often soft softer substrate locations
38:55
have lower water flow and that might

38:58
encourage higher growth rate verses
39:01
location that might be more wave exposed
39:04
and might have slower growth rates over
39:06
time and Beth is asking you could you
39:12
describe how the box and whisker plots
39:14
and your last slide are showing
39:15
differences in variability sure so
39:20
they are showing the the darker line is
39:27
the mean and then the the whiskers are
39:31
showing the I think the 25 percent
39:33
confidential integrals and what you can
39:36
see is that if you were comparing Pema
39:39
quit point and harp spell there really
39:41
isn't any difference in terms of the
39:44
mean asked to fill in length and series
39:47
island has a tremendous amount of
39:49
variability in terms of the ASCO film
39:50
length and the length the mean length is
39:54
greater but not statistically different
39:57
than Harpswell or Pema quits and an
40:00
interesting thing to kind of keep in
40:02
mind is that Pema quick point is a high
40:06
energy environment Ceres island is a low

40:10
energy environment Harpswell is a low
40:13
energy environment but experiences
40:17
harvest and so what you can see is that
40:21
the that those lengths might be
40:26
reflected in terms of harvest might be
40:29
very similar to natural energy that's
40:34
experienced in higher and wave-motion
40:36
locations like Pema quick point and can
40:44
you tell us how many years of data you'd
40:46
like to have this to start to be able to
40:48
see more clear trends in the timing of
40:50
reproductive onset in the spring sure I
40:54
would say that for you know most
40:57
climactic data set know between more
41:03
than five years between five and ten
41:06
years would be very helpful so you know
41:08
if you we only have well after this
41:11
season we'll have four years
41:13
but four years doesn't show you that
41:14
there could be there could still be a
41:16
lot of inter annual variability and so
41:20
that you're not able to really see
41:21
patterns over time you're just seeing

41:23
the noise of the variability that might
41:26
exist naturally without changes in
41:29
temperature and so the longer the day
41:34
continues some more evidence there will
41:38
be if there are patterns of ships of
41:42
those phenyl phases earlier compared to
41:45
later in the season I have another
41:48
question - well I'll pick will take
41:50
George's question guilfoyle
41:53
he said he lost oh he said he lost down
41:55
to an audio yes we'll make that
41:57
available so question about the slide
42:04
that you're on so the bacon and Vadis
42:07
1991 data versus your data 2014 2015 -
42:11
2015
42:13
I mean it looks like so maybe it a
42:19
little more explanation so at the at the
42:23
mid-level mid stage is that's quite a
42:27
big difference I mean in terms of seven
42:31
degrees versus nine point that one
42:32
degree have a difference because it's
42:34
tennis it's a higher stage so so i'm i
42:40
yeah I'm not sure a lot of has to do

42:44
with there were different locations that
42:46
were chosen that the difference between
42:49
taking instantaneous temperature versus
42:52
taking temperature that term data
42:54
loggers and I'm rabl really able to have
42:56
much more confidence in terms of that's
42:59
the temperature that with experience
43:00
during high tide put across the entire
43:03
reproductive season and beforehand and
43:05
so I I think that there there there
43:11
could be a number of reasons that there
43:12
is a difference
43:13
mm-hmm and also methods perhaps exactly
43:17
the method well so um there's another
43:23
question by Michael Adams what time of
43:26
year would we expect to see the new side
43:28
branches begin to form yes so the new
43:31
side it depends on the location so
43:34
different locations are going to have
43:35
kind of different trends and their
43:37
growth but when the receptacles are shed
43:41
they leave this little little side
43:43
branches or little side laterals that

43:46
then
43:47
to have kind of new growth and we saw a
43:55
lot of variability in that incites yeah
43:59
so how long for each species to grow to
44:02
full harvest after being cut word
44:06
possible yes so that's another good
44:08
question George and a lot of it has to
44:10
do with the locality so you know
44:12
depending on each location there are
44:15
some locations in the Gulf of Maine that
44:18
have higher growth rates and others so
44:21
no it really has to do with growth rate
44:25
over time and so it would be hard to
44:28
have a definitive time it really would
44:31
depend on the location have they have
44:35
there been any studies which that show
44:38
that that growth for is all new you
44:45
would be able to see in terms of
44:47
measuring growth rates from each air
44:50
bladder to see what the growth rate or
44:52
um and I don't know of any comprehensive
44:57
research that has looked at that from
44:59
lots of different locations well

45:03
hopefully in five to ten years will be
45:05
exactly that and George is also asking
45:11
our changes in water temperature and
45:13
acidity etc affecting growth of these
45:15
species I would I don't see why it would
45:19
not I you know all of those factors play
45:23
a role in terms of the growth of any
45:25
individual and so in terms of thinking
45:28
about water temperature metabolically
45:30
there's going to be kinetic changes when
45:32
you increase your decrease water
45:34
temperature and in terms of thinking
45:36
about ocean acidification for we for
45:40
photosynthetic organisms that carbon
45:43
question is there going to be more
45:44
carbon dioxide or carbon speciation in
45:47
the water that's going to be available
45:48
for photosynthesis or not and so yes
45:51
indeed it's definitely affect the growth
45:53
of Aska filament and other two koi
45:55
species
46:00
great there any other questions these
46:16
are all great questions so okay we have

46:21
a couple more or one more since exo-m is
46:24
not a plant what should we call it when
46:26
we're talking to you and what should we
46:28
call it when we're talking to a
46:30
newspaper especially I know it's so hard
46:34
I would say that it's it to call it an
46:42
individual or a seaweed or an alga
46:46
because it is in a plant I mean it's
46:49
it's evolutionarily very distant from a
46:51
plant so I was I would try to use
46:54
individual or seaweed or alga good one
47:03
but those are words like see me people
47:05
know but alga is a hard one that's not
47:07
really in people's common language
47:09
vocabularies need to say
47:23
I'm Beth I did enough us okay how many
47:26
years would you ideally like to continue
47:29
this research and are there other
47:31
research questions you'd like to look
47:33
into into the feet in the future yeah I
47:36
would say that many many years a lot of
47:40
a lot of research questions have this
47:43
time like time span of kind of a funding

47:47
cycle in terms of like maybe three to
47:49
five years and that really doesn't allow
47:51
you to see real changes over time I
47:54
think one of the wonderful things about
47:56
some of these research questions is that
47:58
we can utilize the expertise and
48:02
interest of citizen scientists to extend
48:04
that time and the space across the Gulf
48:10
of Maine that people can collect data
48:11
and so ideally like decades worse I mean
48:16
it would be wonderful if people just
48:18
made looking at the phenology of ask a
48:21
film a ritual in the spring in the
48:24
summer and that they teach their
48:26
children and their grandchildren and
48:28
they continue to do it I mean that would
48:30
be the ideal but I'll keep doing it as
48:34
long as I'm around because I think it's
48:37
really very valuable and it provides a
48:39
lot of insight in terms of changes
48:42
across the nearshore environment that
48:46
might not be captured with other
48:49
organisms that might be offshore or

48:51
terrestrial organisms that people might
48:53
be seeing and hearing about in the news
48:56
mmm and ya know go ahead and as for
49:01
other research questions is always heaps
49:03
of lots of other research questions and
49:06
so one potential research question that
49:08
colleagues and I are pursuing is looking
49:12
at not just the relationship between
49:16
Africa filum and few gifts reproductive
49:19
material to in marine invertebrates but
49:24
also the link to birds and so those
49:27
coastal birds that are very important as
49:30
well
49:31
intimacy the the food web dynamics
49:34
between puke white algae and invert
49:38
macroinvertebrates from the intertidal
49:40
and coastal birds that are of interest
49:43
now that's really important the question
49:48
that we get a lot from our volunteer
49:50
observers is you know one the gametes
49:53
are released and there's torn receptacle
49:55
is there a reason to continue monitoring
49:59
or making observations and collecting

50:01
water quality data throughout the summer
50:04
after that it depends I mean I think
50:10
that if once those receptacles are torn
50:14
and they're shed then just kind of the
50:17
onset of when new receptacles are
50:19
present is helpful to record but that
50:22
initiation of new receptacles and that
50:26
if people aren't observing they may miss
50:28
that but and I think also if you keep
50:36
observing you might be observing things
50:38
that others might not be observing and
50:41
so the more you get to know the
50:44
populations that person is observing
50:48
they might see things that are occurring
50:51
there that they can document and so I
50:53
think having sustained observation is
50:57
very helpful great okay
51:02
any other questions well seeing none
51:09
Jesse want to thank you so much for this
51:12
invaluable research that you're doing
51:15
and your connection decides the seasons
51:17
and and thanks to all our volunteers out
51:21
there again this is the first of several

51:24
webinars that we're going to be doing
51:25
over the summer so stay tuned to the
51:28
size of the seasons website and if you
51:31
could hear us we're applauding and
51:33
thanks again Jesse okay thanks so much
51:41
you