(Chinese)

根据 George Balazs 和伍家恩(Connie Kayan Ng) 于 2017 年 3 月 16 日至 18 日在惠东港口海龟国家级自然保护区的非正式造访,向保护区提交关于人工繁殖绿海龟的建议。

我们把建议分为三级别 - 实时、近期、及长期。

以下建议需**即时推行**,因现在是四月,交配和产卵季节应该随即发生:

1）移走在人工繁殖池内的雌性赤蠵龟(红海龟),以免生产杂交海龟。

2）分隔雄性绿海龟及雌性绿海龟在不同的饲养池,使雄性无法看到或透过水中的气味/嗅觉感应到雌性的存在。 分隔期约 3 至 4 周。 直到 5 月初,把雄性放回雌性的饲养池,以刺激交配。

3)在移走雌性赤蠵龟及调离雄性绿海龟的过程中,假设需要排走池中海水,可趁海龟背甲干旱时,在每只海龟背甲的两侧标上记号 (如 1,2,3 或 A、B、C 等),以便利识别。 标记可用环氧树脂胶合漆。 这样可方便辨认个别海龟,例如在交配时、在海滩边缘休息时,以及在沙滩上产卵时。

4）当排走池中海水时,也可借机为海龟收集皮肤样本,并用酒精保存,以进行基因检测。 皮肤样本标示记录,可用海龟肢体上现有的标志编号及背甲标号。 基因

检测的目的是找出产卵地与觅食地的连系。

5）调整水位和/或在混凝土坡面上放置沙粒,确保雌性绿海龟能轻易地从水中爬到海滩上。

近期:

6）每周几次用淡水湿润人工产卵沙滩深处,尤其是被塑料屋顶阻挡天然降雨的沙滩部分。 可考虑使用园艺淋草坪用的水管。 请参考此链接的例子:

https://www.amazon.com/s/?ie=UTF8&keywords=water+hose+soaker&tag=googhydr-20&index=lawngarden&hvadid=181944605236&hvpos=1t2&hvnetw=g&hvrand=4643202297993079204&hvpone=&hvptwo=&hvqmt=b&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9032817&hvtargid=kwd-6065807187&ref=pd_sl_27lb0kzqd0_b_p20

非常重要的是,人工产卵沙滩的沙不能太干。 湿润的沙有助雌龟使用其后肢成功地挖掘造卵窝。 如果沙子太干,不容易被挖沙造窝。

7）沿着人工产卵沙滩后方的混凝土墙种植天然植被,这有助于保持沙中的水分。另外,绿海龟常常喜欢在天然植被下产卵。 在保护区可找到的原生植物草海桐(Scaevola) 是理想的选择。 可参考以下链接:

https://en.wikipedia.org/wiki/Scaevola_(plant)

長遠

8）人工繁殖池体积大而优良。 在人工繁殖池饲养更多大型绿海龟,包括雄雌两

性。 我们访问期间,池内有十只雌龟和八只雄龟。 我们估计繁殖池可轻易、安全及人地道饲养五倍数量的海龟 - 即 50 只雌龟和 40 只雄龟。

9) 搜索及列出国内的水族馆,以找到更多可参与保护区人工繁殖的大型成年绿海龟。

10) 与进行腹腔镜检查的世界权威合作,例如 David Owens 博士,以确定参与人工繁殖海龟的生殖状况。

11) 在保护区召开一个关于人工繁殖海龟的小型研讨会。 邀请数名具有相关经验的专家。 目的是讨论和分享科研信息,促成彼此合作,支持保护区人工繁殖的努力,并为未来动向提出建议。

如果您对上述建议有任何疑问,欢迎随时询问,我们会详细解释。

结语:我们非常赞赏保护区人工繁殖项目的设施及努力。 我们感谢在三天访问中保护区人员的专业精神。 近年保护区内景观和建筑物的改进是美好的。 保护区是全国人民的骄傲。 我们真诚地感谢大家的友谊和照顾。

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Representing the non-governmental non-profit entity:
China/Hawaii Aloha Alliance for Marine Turtle Conservation and Research
中国/夏威夷 阿罗哈海龟保育暨研究联盟

(English)

Suggestions to Assist Captive Breeding Efforts at the Huidong Gangkou Sea Turtle National Nature Reserve- Submitted by George Balazs and Connie Kayan Ng -Based on an Informal Visit to the Reserve 16-18 March 2017.

We have divided our suggestions into three categories- Urgent Immediate; In The Near Future; and Longer Term.

The following suggestions are considered URGENT IMMEDIATE because it is now April and the mating and nesting season should occur very soon:

1) Remove the large female loggerhead from the tank with the female green turtles to prevent any possibility of hybrids being produced.

2) Separate the male green turtles into a different tank away from the female green turtles so they can not see one another nor sense the females via in-water smell/ olfaction. Keep the males separated for 3-4 weeks- until early May- then put them into the tank with the females with the objective of stimulating copulation.

3) In the process of removing the loggerhead and temporarily relocating the males, take the opportunity to mark each turtle's carapace (e.g., 1, 2, 3 or A, B, C etc) on each side for easy visual recognition. Epoxy paint could be used to make the identifying marks. This will allow individual turtles to be identified when they are seen copulating, resting out of the water at the beach edge, and when they are on the beach nesting. The assumption is that, in removing the loggerhead and relocating the males, the tank will need to be drained of sea water, hence the carapace marks can be made when the turtles are dry.

4) When the tank is drained, also take the opportunity to collect small biopsy skin samples preserved in alcohol for eventual DNA genetic testing. Record existing flipper tag numbers and carapace numbers for each turtle to use in labeling the skin sample vials. The purpose DNA genetics analysis would be to identify the source nesting stock of the turtles.

5) Ensure that the female turtles can easily crawl from the water onto the beach without slippage by manipulating the appropriate water level and/or putting more sand on the concrete slope.

IN THE NEAR FUTURE:

6) Several times a week use fresh water to moisten deeply into the sand of the nesting beach- especially in the area where natural rainfall is blocked from the beach by the plastic sheet roof. A lawn soaker hose would be suitable- Please see this link for an example:

https://www.amazon.com/s/?ie=UTF8&keywords=water+hose+soaker&tag=googhydr-20&index=lawngarden&hvadid=181944605236&hvpos=1t2&hvnetw=g&hvrand=4643202297993079204&hvpone=&hvptwo=&hvqmt=b&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9032817&hvtargid=kwd-6065807187&ref=pd_sl_27lb0kzqd0_b_p20

It's very important that the nesting beach sand not be too dry. Moisture of the sand is needed for a female to successfully excavate the egg chamber using her hind flippers. If the sand is too dry slippage will occur and the egg chamber can't easily be dug.

7) Plant natural vegetation along the back concrete wall of the nesting beach. This will help to hold moisture in the sand. Also, green turtles often like to nest under natural vegetation. The native plant, Scaevola, that occurs at the reserve would be ideal for this purpose. Please see this link:
https://en.wikipedia.org/wiki/Scaevola_(plant)

LONGER TERM:

8) Obtain more large green turtles- both females and males- to add to the breeding stock tank. The tank is large and excellent. Ten females and 8 males were present during our visit. We estimate that the tank could easily, safely and humanely hold five times that number- i.e., 50 females and 40 males.

9) Undertake a search of as many aquariums in China as possible to locate large adult green turtles for possible transport for loan to the Reserve's captive breeding effort.

10) Collaborate with a world authority on laparoscopy, such as Dr. David Owens, to determine the internal reproductive status the Reserve's breeding stock.

11) Convene a small workshop on captive breeding at the Reserve. Invite several experts with experience in captive breeding of green turtles. The goal would be to discuss and share information leading to collaborations with sea turtle scientists that support the Reserve in it's efforts, and to obtain additional recommendations for future actions.

If you have questions about any of the above suggestions, please feel free to ask and we will explain in greater detail.

Closing Statement: We were highly favorably impressed with the facilities and efforts devoted to the Reserve's captive breeding project. We are appreciative for the professionalism shown to us during our three-day visit. The improvements recently made to the Reserve's landscape and buildings are absolutely beautiful. The Reserve is clearly a national pride for all the people of China. We sincerely extend our thanks to everyone for their friendship and hospitality.

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