RGC Ref. No.:
UGC/FDS17/M07/14
(please insert ref. above)

RESEARCH GRANTS COUNCIL
COMPETITIVE RESEARCH FUNDING SCHEMES FOR
THE LOCAL SELF-FINANCING DEGREE SECTOR

FACULTY DEVELOPMENT SCHEME (FDS)

Completion Report
(for completed projects only)

Submission Deadlines:
1. *Auditor's report with unspent balance, if any: within **six** months of the approved project completion date.*
2. *Completion report: within **12** months of the approved project completion date.*

Part A: The Project and Investigator(s)

1. Project Title

Applicability of Virtopsy in Stranded Finless Porpoises in Hong Kong Waters (*Neophocaena phocaenoides*) and the Yangtze River (*Neophocaena asiaeorientalis* ssp. *asiaeorientalis*)

2. Investigator(s) And Academic Department(s) / Unit(s) Involved

Research Team	Name / Post	Unit / Department / Institution
Principal Investigator	Dr. Kot Brian Chin Wing, Assistant Professor	School of Medical and Health Sciences, Tung Wah College
Co-investigator	Dr. Martelli Paolo, Chief Veterinarian	Department of Zoological Operations and Education, Ocean Park Corporation
Co-investigator	Dr. Fernando Nimal, Senior Veterinarian	Department of Zoological Operations and Education, Ocean Park Corporation
Co-investigator	Prof. Wang Ding, Head & Professor; Vice Director	Key Laboratory of Aquatic Biodiversity and Conservation; Institute of Hydrobiology, The Chinese Academy of

		Sciences, Wuhan
Co-investigator	Dr. Hao Yujiang, Associate Professor	Institute of Hydrobiology, The Chinese Academy of Sciences, Wuhan, China
Co-investigator	Dr. Heng Hock Gan, Clinical Associate Professor	Department of Veterinary Clinical Sciences, Purdue University, West Lafayette, Indiana, USA
Co-investigator	Ms. Gendron Suzanne, Foundation Director	Ocean Park Conservation Foundation Hong Kong

3. Project Duration

	Original	**Revised**	**Date of RGC / Institution Approval** *(must be quoted)*
Project Start Date	September 2014	5 November 2014	3 November 2014
Project Completion Date	August 2016	4 November 2016	3 November 2014
Duration *(in month)*	24		
Deadline for Submission of Completion Report		3 November 2017	

Part B: The Final Report

5. Project Objectives

5.1 Objectives as per original application

1. To develop a new set of CT and MRI imaging protocols and techniques for stranded finless porpoise (FP)/Yangtze finless porpoise (YFP) postmortem pathological diagnosis.
2. To investigate the feasibility of virtopsy as a supplement to stranded FP/YFP necropsy practice for pathological investigation.
3. To evaluate the accuracy and reliability of virtopsy for stranded FP/YFP post-mortem pathological diagnosis in comparison to that of the standardised conventional necropsy practice.
4. To identify the pathological history of the stranded FP/YFP carcasses by using virtopsy and standard conventional necropsy practice.

5.2 Revised objectives

Date of approval from the RGC: N/A

Reasons for the change: N/A

5.3 Realisation of the objectives
(Maximum 1 page; please state how and to what extent the project objectives have been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

The project has progressed satisfactorily and its objectives have been fully accomplished. The realization of the 4 project objectives are illustrated as below:

1. To develop a new set of CT and MRI imaging protocols and techniques for stranded FP/YFP postmortem pathological diagnosis.

As of 4 November 2016, 163 stranded cetacean carcasses have been collected and 132 virtopsy were performed to evaluate the underlying pathologies leading to the animal death and corresponding biological profiles. Summative experiences from part of the virtopsy examinations and procedural preparations were included in the last progress report. A holistic approach for a general whole body virtopsy protocol with technical considerations (wide-bore designs of scanning units), carcass preparation, and pitfalls in management was recommended, published, and implemented as the routine protocol for stranded cetacean virtopsy. The protocol allows standardized reporting in cetacean stranding response program

with virtopsy as an integral part, associated stranding networks or research institutions worldwide that perform postmortem/forensic investigation to provide evidence for cause of death, biological health and profiles of stranded cetaceans.

2. To investigate the feasibility of virtopsy as a supplement to stranded FP/YFP necropsy practice for pathological investigation.

This project demonstrated virtopsy is a potentially powerful tool, providing non-invasive and objective measurements to supplement the necroscopic findings for cetacean profile health and profile investigation. Virtopsy could also facilitate veterinary personnel to perform image-guided target specimen necropsy and sampling for histology and toxicology. The calibrated 3-D documentation and analysis of virtopsy findings would lead to qualitative improvements in conventional necropsy, with increased chance of cause of death identification (from 10% identified by Conventional necropsy (CN) to 42% identified by virtopsy and CN) in these stranded carcasses.

3. To evaluate the accuracy and reliability of virtopsy for stranded FP/YFP post-mortem pathological diagnosis in comparison to that of the standardised conventional necropsy practice.

Blinded findings of CT was compared with those of CN in 10 cases of stranded finless porpoises in China to evaluate the accuracy of virtopsy. We classified discrepancies between virtopsy and CN pathological diagnosis as none, minor, or major, with major indicating involvement of different pathologies or organs. Virtopsy, in particular PMCT does have several promising features in postmortem examination, and PMCT should be used more as a supplement rather than an alternative to CN, because it can diagnose extra injuries which are hard to detect and therefore frequently overseen during CN. Correlation of PMCT/PMMRI and CN results was conducted by comparing and evaluating the imaging and necropsy results with regard to recognition of findings categorized into various anatomical regions: head & extremities, thorax, abdomen, and vertebral column, with the “gold standard” of CN. Results of these were included in the manuscripts under peer-review for later journal publication.

4. To identify the pathological history of the stranded FP/YFP carcasses by using virtopsy and standard conventional necropsy practice.

With the combined effort of virtopsy and CN, various pathologies and injuries caused by human interaction have been identified in stranded FP/YFP carcass. This provide concrete evidence for implementation of additional mitigation measures to reduce mortality from these reasons and help conserve the species. Most of the radiological findings, pertaining to head and neck, heart and vascular, thorax, abdomen, vertebral column and pectoral limbs, corresponded to necroscopic findings. PMCT was useful in diagnosing fatal hemorrhage, organ herniation, and pathological gas collection, as well as determining the number, shapes and characteristics of the fractures sites and the direction of external force. PMMRI was effective in evaluating soft tissue lesions, musculoskeletal injuries, integrity of spinal cord and brain herniation. Radiological assessment of the degree of epiphyseal fusion/ossification at postcranial skeleton allowed individual age-at-death estimation, supplementing the data

obtained by dental growth layer group pattern. Gradual increment of postmortem gas accumulation in the brain, pleural cavity, mediastinum, esophagus, cardiac chambers, subcutaneous tissue, gastrointestinal tract, liver, spleen, kidney, blood vessels and musculatures could be quantified with PMCT, which might gain invaluable insight to the individual death interval. Results of these were included in the manuscripts under peer-review for later journal publication.

5.4 Summary of objectives addressed to date

Objectives *(as per 5.1/5.2 above)*	**Addressed** *(please tick)*	**Percentage Achieved** *(please estimate)*
1. To develop a new set of CT and MRI imaging protocols and techniques for stranded FP/YFP post-mortem pathological diagnosis.	√	100%
2. To investigate the feasibility of virtopsy as a supplement to stranded FP/YFP necropsy practice for pathological investigation.	√	100%
3. To evaluate the accuracy and reliability of virtopsy for stranded FP/YFP post-mortem pathological diagnosis in comparison to that of the standardised conventional necropsy practice.	√	100%
4. To identify the pathological history of the stranded FP/YFP carcasses by using virtopsy and standard conventional necropsy practice.	√	100%

6. Research Outcome

6.1 Major findings and research outcome
(Maximum 1 page; please make reference to Part C where necessary)

The major findings and research outcome, which were presented, published or submitted for publication as in Part C, are as follows:

As of 4 November 2016, 163 stranded cetacean carcasses in the HK and China waters have been collected and virtopsy were performed to evaluate the underlying pathologies leading to the animal death and corresponding biological profiles. Whole body virtopsy of 104 carcasses were performed and analyzed for pathologic findings during the captioned project time.

Routine integration of virtopsy into cetacean stranding response program was proven not only posed little problem for the experienced stranding response team, but also added value for the conventional necropsy results from improved planning and better diagnostics. The initial management of stranded carcass and the death investigation should be equally well performed, which often follows accurate and reliable virtopsy examinations. A thoughtful management in a cetacean stranding response program with virtopsy as an integral part would yield valuable supplementary information prior to the conventional necropsy for the death investigation of stranded cetaceans.

PMCT and PMMRI imaging protocols and techniques for stranded FP/YFP postmortem pathological diagnosis were reviewed and recommended with particular reference to procedural rundown and pitfalls in management. Results indicated that slice and volumetric visualization are the most useful on stranded cetaceans. Multiplanar reconstruction shows other planes, which are not acquired directly during the acquisition in axial plane. It is useful to assess any intact anatomical structure/pathology in any required plane, and it is even possible to obtain a curved plane for visualization of the anatomical details of vessels. Maximum intensity projection emphasizes the highly intense and narrow structures in the carcass, which is useful to detect metallic foreign bodies, calcifications in vessels and tracheobronchial tree, and small lung nodules. Shaded surface display creates three-dimensional images of surface information of various tissues of the carcass. With successive interactive steps of exclusion/inclusion of these different tissue types and resizing/trimming of the region of interest, surfaces that would otherwise be very difficult to visualize can be visualized. It is particularly helpful in studying articular surface fracture lines, which often remain hidden behind adjacent bone surfaces. Direct volume rendering (DVR) generates a three-dimensional volume in a two-dimensional platform, which increases the three-dimensional spatial understanding of the anatomical structure/pathology when the observer rotates the volume structure and facilitates the search of optimal view/set of views to answer a pathological question. Transfer function in DVR controls the opacity, brightness, and colour of selected volume, which allows the observer to selectively reveal structures that would otherwise be obscured in virtopsy.

PMCT was superior to necropsy in revealing skeletal trauma, whereas PMMRI was superior to PMCT and CN in detecting soft tissue anomalies of central nervous system, abdominal organs, blubber and musculatures. PMUSG was keen to assess abdominal soft tissue anomalies, except

in advanced decomposed carcass. The documentation and analysis of virtopsy findings were investigator independent, objective, and non-invasive, which provided better understanding to the causes of death of stranded cetaceans, and could eventually help generate effective conservation measures.

This study demonstrated virtopsy is a potentially powerful tool, providing non-invasive and objective measurements to supplement the necroscopic findings for cetacean death and life history investigation. Virtopsy could also facilitate veterinary personnel to perform image-guided target specimen necropsy and sampling for histology and toxicology. The calibrated 3-D documentation and analysis of virtopsy findings would lead to qualitative improvements in conventional necropsy.

6.2 Potential for further development of the research and the proposed course of action *(Maximum half a page)*

Digital storage of pathological virtopsy details represents a permanent record of the event that can be used later for re-evaluation from multiple opinions or education. Image and data processing allows 2-D and 3-D views of anatomical findings and facilitates objective visualisation and recapitulation of results for cause of death analysis. Anatomy atlases by species and technique can be readily complied by virtopsy, and constitute invaluable references for veterinarians unfamiliar with an imaging technique or the anatomy of interest.

Implementation of virtopsy creates the new challenge of adding virtopsy datasets to conventional marine stranding and mortality databases. Most of the virtopsy datasets have expressed and exported in “Digital Image and Communications in Medicine” format to avoid the reduction of image information and quality. The storage and visualization of volumetric image datasets has become a concern. They are large in storage size and require advanced visualization software to review and reconstruct for detailed examination in high resolution. This induces a certain burden to the performance of the database server and affects the design of database architecture.

Growing complexity of virtopsy and associated postmortem investigation procedures requires the frequent exchange of knowledge among experts in a multidisciplinary team. The proposed course of action for this challenge is to develop a centralized database, which could act as a tool to 1) standardize and document both necropsy and virtopsy findings digitally; 2) compile, categorize, and annotate image and multimedia datasets acquired for comparison of the necropsy and virtopsy findings; and to 3) provide a centralized location for on-going postmortemdata collection for research and review on resource management in related government agencies.

7. Layman’s Summary

(Describe <u>in layman’s language</u> the nature, significance and value of the research project, in no more than 200 words)

This study aimed to develop a new set of postmortem CT and MRI imaging protocols and techniques, and to apply it to cetacean stranding response program with virtopsy as an integral part for Hong Kong stranded finless porpoises (FP) and Yangtze finless porpoises (YFP) in

mainland China. The result of the study contributed to the practice of postmortem investigation by virtopsy, in addition to the conventional necropsy information.

With the advantages of being observer-independent, non-subjective, non-invasive, digitally storable and transferable, thereby facilitating a second opinion, virtopsy has become a valuable alternative technique to provide new insights of findings in stranded carcasses. For example, atlanto-occipital dissociation was among the recognizable findings commonly observed in virtopsy of the stranded cetaceans in Hong Kong and adjacent waters, which could be difficult to recognize via necropsy.

Results provided better understanding and insight into causes of death, biological health and profiles of the stranded carcasses, while posing precise conservation measures for the vulnerable Hong Kong local resident FP and critically endangered YFP populations.

Part C: Research Output

8. Peer-Reviewed Journal Publication(s) Arising Directly From This Research Project

(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				**Author(s)** *(denote the corresponding author with an asterisk*)*	**Title and Journal / Book** *(with the volume, pages and other necessary publishing details specified)*	**Submitted to RGC** *(indicate the year ending of the relevant progress report)*	**Attached to this Report** *(Yes or No)*	**Acknowledged the Support of RGC** *(Yes or No)*	**Accessible from the institutional repository** *(Yes or No)*
Year of Publication	**Year of Acceptance** *(For paper accepted but not yet published)*	**Under Review**	**Under Preparation** *(optional)*						
2017				HLA Yuen, HCL Tsui, BCW Kot*	Accuracy and reliability of cetacean cranial measurements using computed tomography three dimensional volume rendered images. PloS ONE 12(3): e0174215	No	Yes (Appendix 1)	Yes	Yes
	2017			DKP Chan, HCL Tsui, BCW Kot*	Database documentation of marine mammal stranding and mortality: current status review and future prospects. Diseases of Aquatic Organisms	No	Yes (Appendix 2)	Yes	Yes
	2017			S Dennison, BCW Kot	Diagnostic Imaging in Marine Mammals", in Dierauf, L.A. and	No	No	Yes	Yes

					Gulland, F.M.D. (eds.) CRC handbook of marine mammal medicine: Health, disease, and rehabilitation 3rd edition. Boca Raton, FL: CRC Press (Book chapter)				
		√		BCW Kot*, N Fernando, S Gendron, HG Heng, P Martelli	Postmortem CT and MR imaging of stranded cetaceans with advanced autolysis. *Scientific reports*	No	No	Yes	Yes
		√		BCW Kot*, HG Heng, P Martelli	Evaluation of an Indo-Pacific humpback dolphin exhibiting evidence of sharp force trauma using virtopsy approach. BMC Veterinary Research	No	No	Yes	Yes
		√		BCW Kot*, DKP Chan, HLA Yuen, FHM Wong, CL Tsui	Morphological analysis of the foramen magnum in finless Porpoise (genus *Neophocaena*) using postmortem computed tomography three-dimensional volume rendered image.	No	No	Yes	Yes

					Marine Mammal Science				
		√		BCW Kot*, HLA Yuen, DKP Chan	Recognition of atlanto-occipital dissociation in stranded finless porpoises (genus *Neophocaena*) using postmortem computed tomography. Scientific Reports	No	No	Yes	Yes

9. Recognized International Conference(s) In Which Paper(s) Related To This Research Project Was / Were Delivered

(Please attach a copy of each conference abstract)

Month / Year / Place	**Title**	**Conference Name**	**Submitted to RGC** *(indicate the year ending of the relevant progress report)*	**Attached to this Report** *(Yes or No)*	**Acknowledged the Support of RGC** *(Yes or No)*	**Accessible from the institutional repository** *(Yes or No)*
December 2015 / USA	Can necropsy go bloodless: Applicability of virtopsy as a routine procedure in stranded cetaceans in the Hong Kong waters.	21st Biennial Conference on the Biology of Marine Mammals	2015	Yes (Appendix 3)	Yes	Yes
December 2015 / USA	Cetacean stranding response program with virtopsy as an integral part in Hong Kong: Pitfalls in management	21st Biennial Conference on the Biology of Marine Mammals	2015	Yes (Appendix 4)	Yes	Yes

December 2015 / USA	Accuracy and reliability of cetacean cranial morphometrics using computed tomography 3-D volume rendered image	21st Biennial Conference on the Biology of Marine Mammals	2015	Yes (Appendix 5)	Yes	Yes
May 2016 / USA	Utilization of computed tomography in assessing fusion pattern of vertebral non-epiphyseal suture in Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) in the Hong Kong waters	47th International Association for Aquatic Animal Medicine	No	Yes (Appendix 6)	Yes	Yes
May 2016 / USA	Role of image reformation techniques in postmortem computed tomography imaging of stranded cetaceans	47th International Association for Aquatic Animal Medicine	No	Yes (Appendix 7)	Yes	Yes
May 2016 / USA	The virtopsy approach: Bridging necroscopic and radiological data for death investigation of stranded cetaceans in the Hong Kong waters.	47th International Association for Aquatic Animal Medicine	No	Yes (Appendix 8)	Yes	Yes
May 2016 / USA	Preliminary assessment of cranial cervical dislocation in stranded cetaceans using multislice computed tomography	47th International Association for Aquatic Animal Medicine	No	Yes (Appendix 9)	Yes	Yes
May 2017 / Mexico	Into the Decomposed Brain of Deceased Cetaceans: Virtopsy Using Postmortem Computed Tomography and Magnetic Resonance Imaging	48th International Association for Aquatic Animal Medicine	No	Yes (Appendix 10)	Yes	Yes

May 2017 / Mexico	Stranded Cetaceans Postmortem Multimedia Analysis Platform (SCPMAP): Pilot Web-Accessed Database of A Virtopsy-Driven Stranding Response Program in The Hong Kong Waters	48th International Association for Aquatic Animal Medicine	No	Yes (Appendix 11)	Yes	Yes
May 2017 / Mexico	Postmortem Computed Tomography Findings of By-catch Indo-Pacific Finless Porpoise (*Neophocaena phocaenoides*) in Bohai Sea and Yangtze River.	48th International Association for Aquatic Animal Medicine	No	Yes (Appendix 12)	Yes	Yes
May 2017 / Mexico	To See or Not To See: The Need for Attention on Computed Tomography Features of Postmortem Change and Decomposition in Stranded Cetaceans.	48th International Association for Aquatic Animal Medicine	No	Yes (Appendix 13)	Yes	Yes

10. Whether Research Experience And New Knowledge Has Been Transferred / Has Contributed To Teaching And Learning

(Please elaborate)

The PI has integrated this research project with courses on Radiographic Imaging Science (MED2016), Introduction to Medical Imaging (MED2019), Imaging Anatomy (MED2020), Research Methods in Medical Science (MED3001), Techniques in Human Identification (MED3005), and Computed Tomography (MED3020), offered for Bachelor of Medical Science year 1-4 students in Tung Wah College (TWC).

This project aimed to investigate the applicability of virtopsy in stranding response program of stranded FP in Hong Kong and YFP in mainland China. Since March 2014, virtopsy has emerged as a new routine postmortem examination technique to augment conventional necropsy in stranded finless porpoises in the HK waters, identical techniques have also been extended to biological health and profile investigation of other stranded cetaceans. New set of CT and MRI imaging protocols and techniques has been recommended to Agriculture, Fisheries and Conservation Department, Government of the Hong Kong Special Administrative Region, Cetacean Stranding Response Team of Ocean Park Conservation Foundation, Hong Kong (OPCFHK) and various stranding networks in Asia, and whole body

postmortem computed tomography (PMCT) and postmortem magnetic resonance imaging (PMMRI) were conducted in HK and adjacent Asian countries to create a number of volumetric image datasets.

This project has been branched into various subprojects for final year undergraduate students in TWC (Forensic science and Basic Medical Sciences major) to experience how practical inter-disciplinary research project works with effort contributed from respective expertise. Instead of being merely a school assignment, this provided them an opportunity to demonstrate their work at the international aquatic animal medicine conference platform and a pathway to enter global research arena. Recognition and report of students' effort has attracted media attention shown in the following links (http://hk.on.cc/hk/bkn/cnt/news/20160721/bkn-20160721071528373-0721_00822_001.html http://www.twc.edu.hk/po/wp-content/uploads/sites/20/2016/10/TW2016-Oct.pdf).

A volunteer project named as "Local Cetacean Conservation Project for Bachelor of Medical Science students" was co-organized by our working partner, OPCFHK and our college TWC, since November 2014. Students were then be equipped with adequate knowledge via orientation talk and training session conducted by the project team experts, and were successively assigned to assist in various project associated duties, for example, assisting the Cetacean Stranding Response Team of OPCFHK for local stranding investigation and follow-up tasks, assisting the virtopsy procedures in stranded cetaceans for pathological investigations, as well as supporting OPCFHK on research data entry for database and other information collection. Besides, they will be required to participate and conduct dolphin boat trip narration by OPCFHK to spread conservation messages to secondary school students, and support other public awareness, fund-raising activities and office work in OPCFHK. Thirty eight Bachelor of Medical Science (Honours) (BMS) students from TWC were shortlisted and devoted their time and effort to this project by then.

Subsequently, another mass recruitment of the captioned project, with the expansion to include students from the whole School of Medical Science (i.e. students of BMS, Bachelor of Science (Honours) in Occupational Therapy, and Associate in Health Studies) in TWC, was conducted in September 2015. Additional 25 students were recruited since October 2015 as the volunteers in this captioned project, with their service ended by September 2016.

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11. Student(s) Trained

(Please attach a copy of the title page of the thesis)

Name	**Degree Registered for**	**Date of Registration**	**Date of Thesis Submission / Graduation**
CHONG Chung Man Kathie	Bachelor of Medical Science (Honours)	Sep 2014	May 2017
CHEUNG Cheuk Wai Matthew	Bachelor of Medical Science (Honours)	Sep 2014	May 2017

YU Siu Ho Sasori	Bachelor of Medical Science (Honours)	Sep 2014	May 2017
CHAN Chun Hong Bob	Bachelor of Medical Science (Honours)	Sep 2014	May 2017
CHAN Kam Ping Derek	Bachelor of Medical Science (Honours)	Sep 2014	May 2017
WONG Hong Chin Kyle	Bachelor of Medical Science (Honours)	Sep 2013	May 2016
Wong Tsz Ting Brian	Bachelor of Medical Science (Honours)	Sep 2013	May 2016
LING Pan Hin Ashton	Bachelor of Medical Science (Honours)	Sep 2013	May 2016
WONG Lap Yan Bosco	Bachelor of Medical Science (Honours)	Sep 2013	May 2016
LAM Siu Chung Christopher	Bachelor of Medical Science (Honours)	Sep 2013	May 2016
WONG Ho Man Francis	Bachelor of Medical Science (Honours)	Sep 2013	May 2016

12. Other Impact

(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, teaching enhancement, etc.)

A. Award of patents or prizes

Travel grant for primarily working scientists was awarded by the Society for Marine Mammalogy on team projects entitled, “Cetacean stranding response program with virtopsy as an integral part in Hong Kong: Pitfalls in management”, which was presented in the 21st Biennial Conference on the Biology of Marine Mammals held on 13-18 December 2015 in San Francisco, California, USA.

In 2015/2016, research excellence award was granted by TWC to PI to acknowledge excellent research performance and promote the sharing of best practices in research.

B. Professional/Scholar/Public recognition

PI has been engaged in local governmental scientific advisory boards during the course of the project; and was invited to provide comments and advice regarding marine mammal conservation for government and the Hong Kong Airport Authority, under the capacity of membership in the following 2 working groups since 2015:

- Member of the Marine Mammal Conservation Working Group, Agriculture, Fisheries and Conservation Department, The Government of the Hong Kong Special Administrative Region, Hong Kong
- Member of the Professional Liaison Group for the Three-Runway System Project at the Hong Kong International Airport, Airport Authority Hong Kong, Hong Kong

C. Media interviews

Reported and interviewed by the Cable TV Hong Kong in 2 episodes of a television programme "寵物ER2" regarding the virtopsy project, which were released on 24 May 2015 (http://ent.i-cable.com/program/ervets/videoPlay.php?video_id=47480) and 7 June 2015 (http://ent.i-cable.com/program/ervets/videoPlay.php?video_id=47703) respectively.

Interviewed by the Radio Television Hong Kong television programme "Hong Kong Geographic (山水搜記)" regarding the virtopsy project on 10 October 2015. The tentative broadcast time is spring 2016.

13 newspaper articles

1. 「90 後學做鯨豚法醫 無懼屍臭幾日不散」，蘋果日報，2017-05-08 (http://hk.apple.nextmedia.com/realtime/news/20170508/56663588)
2. 「東華學院採影像解剖 重建鯨豚 3D 頭骨」，星島日報，2017-05-08 (http://std.stheadline.com/daily/news-content.php?id=1595070&target=2)
3. 「東華學院研「影像解剖」 了解擱淺鯨豚死因」，東方日報，2017-05-08 (http://orientaldaily.on.cc/cnt/news/20170508/00176_037.html)
4. 「影像解剖技術應用於鯨豚 東華學院師生：既省時又準確」，am730，2017-05-08 (https://www.am730.com.hk/news/share/76994)
5. 「東華生證「影像解剖」準確率 88%」，文匯報，2017-05-08 (http://paper.wenweipo.com/2017/05/08/ED1705080004.htm)
6. 東華學院「影像解剖」鑑定鯨豚頭骨」，大公報，2017-05-08 (http://www.takungpao.com.hk/finance/text/2017/0508/79670.html)
7. 「【科研海陸空海洋篇】影像解剖 拯救鯨豚」
「【痛失機會】爭議救不救「希望」終失「望」」
「【預防肺病】免遺漏線索 防感染疾病」
「【傳承意義】「老人」首訪亞 來年講經歷」
文匯報，2017-03-28 (http://pdf.wenweipo.com/2017/03/28/a12-0328.pdf)
8. 「研究擱淺江豚 東華學院師生冀保瀕危動物」，東方日報，2016-09-26 (http://hk.on.cc/hk/bkn/cnt/news/20160926/bkn-20160926071547818-0926_00822_001.html)
9. 「東華學院助理教授成首位榮獲 RU Dunn 獎亞洲學者」，東方日報，2016-07-21 (http://hk.on.cc/hk/bkn/cnt/news/20160721/bkn-20160721071528373-0721_00822_001.html)
10. 「影像解剖查死因 首用於海豚」， 香港經濟日報， 2015-02-11
11. 「突昏迷不能浮獸醫搶救無效注射長眠針「希望」無痛下走了」，香港蘋果日報，2015-02-10 (http://hk.apple.nextmedia.com/news/art/20150211/19037660)
12. 「擱淺海豚遭高速船撞斷頸」，香港蘋果日報， 2015-01-04 (http://hk.apple.nextmedia.com/news/art/20150105/18991852)
13. 「影像解剖 補充傳統不足」， 新報， 2014-10-06

B. Collaboration with other research institutions

The team established working partnership with National Museum of Natural Science, Taichung, Taiwan and learned practical techniques for dried bone preparation from stranded FP carcass.

The team also established working partnership with Sea Mammal Research Unit, University of St Andrews, St. Andrews, UK to understand further the biological profile of FP in the HK waters using boat surveys and passive acoustic monitoring techniques.

D. Teaching enhancement

Two teams (6 in 2015/2016; 5 in 2016/2017) of BMS final year students conducted cetacean virtopsy pilot study as their Honours Year Project. This pilot study was finished by summer 2016 and 2017 respectively and positive comments were well-received.

Six undergraduate student's abstracts were accepted as an oral/post presentations in 3 international marine mammal medicine/conservation conferences in 2015-2017. Details of the conference proceedings were attached in this final report (Part C. 9 & Appendix).

A joint Hong Kong- Institute of Hydrobiology (IHB) Chinese Academy of Science virtopsy operation were undertaken in mid-August 2016 for 2 weeks. The team consisted of PI, research assistant, 5 BMS students of TWC, as well as the professional veterinary team from the Hong Kong Ocean Park (HKOP). Over 60 critically endangered YFP carcasses had undergone virtopsy with the developed novel postmortem imaging protocols by the team, at the Zhongnan Hospital of Wuhan University, followed by full conventional necropsy. The TWC students learnt professional techniques and knowledge of conventional necropsy from the HKOP veterinarian team. They also exchanged ideas actively with teachers and postgraduate students of IHB.

The project results contributed to the practice of postmortem pathological investigation by virtopsy, in addition to the conventional necropsy information. The results were ultimately beneficial to the international scientific community, by providing insight into causes of death, while posing precise conservation measures for these vulnerable Hong Kong resident finless porpoises.

E. Others

A volunteer project named as "Local Cetacean Conservation Project for BMS students" was co-organized by our working partner, OPCFHK and TWC, since November 2014. Students were then be equipped with adequate knowledge via orientation talk and training session conducted by the project team experts, and were successively assigned to assist in various duties, for example, assisting the Cetacean Stranding Response Team of OPCFHK for local stranding investigation and follow-up tasks, assisting the virtopsy procedures in stranded cetaceans for pathological investigations, as well as supporting OPCFHK on research data entry for database and other information collection. Thirty eight BMS students from TWC were shortlisted and devoted their time and effort to this project by then.

Subsequently, another mass recruitment of the captioned project, with the expansion to include students from the whole School of Medical Science (i.e. students of BMS, Bachelor of Science (Honours) in Occupational Therapy, and Associate in Health Studies), was conducted in

September 2015. Extra 25 students were recruited since October 2015 as the volunteers in this on-going project, with their expected service ended by September 2016.

13. Public Access Of Completion Report

(Please specify the information, if any, that cannot be provided for public access and give the reasons.)

Information that Cannot Be Provided for Public Access	**Reasons**