出國報告（出國類別：開會）

2024 年第二十七屆國際昆蟲學大會

服務機關：環境部化學物質管理署

姓名職稱：賴致勳 技士

派赴國家：日本

出國期間：113 年 8 月 25 日至 8 月 31 日

報告日期：113 年 9 月 16 日

摘要

國際昆蟲學大會（International Congress of Entomology, ICE）係全球昆蟲學領域學術研討會議，由德裔英籍昆蟲學家 Karl Jordan(1861-1959)倡議創立，自西元 1910 年第一屆會議在比利時布魯塞爾召開以來，除第二次世界大戰期間外，大抵以 4 年為週期召開大會，迄今已有 114 年歷史，堪譽為「昆蟲學界奧林匹克」，與會成員來自日本、臺灣、中國、美國、加拿大、俄羅斯、荷蘭、德國、義大利、巴西、阿根廷、澳洲及紐西蘭等地之昆蟲領域相關專家學者，本年度(2024)第 27 屆 ICE(簡稱 ICE2024)假日本國立京都國際會館舉辦，辦理期間為 8 月 25 日至 8 月 30 日，由日本昆蟲學會主辦。該研討會主題與我國環境用藥管理相關議題涵蓋氣候變遷造成之害蟲生態變化與其管理防治思維探討、害蟲抗藥性研究、新殺蟲劑科學技術之研究、害蟲管理及生物防治等議題。

本次大會共計安排 6 場全體會議演講、20 項主議題(包含醫學與獸醫昆蟲學、害蟲管理、除害劑、基因改造作物、抗藥性與毒理學等)及 176 項子議題之學術研究成果報告交流分享（包括座談會與海報展示報告）、日本文化體驗及昆蟲認識等活動行程，與會人員多為國際昆蟲、病媒害蟲與農業害蟲相關研究領域之學者、科研機構與產業代表等，藉由國際間產學研究交流，促進合作，以應對近年氣候變遷造成之傳染病、農業生產及環境保護等問題，爰透過派員參與該學術研討會，可瞭解國際環境害蟲防治管理之最新發展技術與其趨勢，做為我國環境用藥管理制度擬定與科技研究發展之參據。

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一、目的

有鑑於國際現正面臨氣候變遷調適與三軸轉型(風險管理、永續發展(ESG)及數位轉型)之挑戰，我國環境用藥產業亦無法置身事外，而本署作為環境用藥監管與政策擘劃單位，應蒐羅國際產學研界科技進展趨勢之資訊，以擬定與時俱進之政策，促進本國環境用藥產學研界發展。而 ICE 做為全球昆蟲學領域學術研討會之標竿，本次 ICE2024 亦提供全球各地昆蟲學最為前瞻之研究，共計安排 20 項主議題座談會，與環境用藥相關之議題包括醫學與獸醫昆蟲學(Medical and Veterinary Entomology)、害蟲管理(Pest Management)及除害劑、基因改造作物、抗藥性及毒理學(Pesticides, GM Crops, Resistance and Toxicology)，爰透過參與上述議題之子項座談會，瞭解國際環境害蟲防治管理最新技術，如經驗動態建模(Empirical dynamic modeling)作為害蟲數量預測工具之應用性、AI 輔助辨識害蟲及綠色化學殺蟲(忌避)劑成分研究等，足供做為相關管理政策研擬之參考，以精進我國環境用藥管理與病媒防治品質。

二、過程

本研討會行程如表 1，ICE2024 舉辦時間為 2024 年 8 月 25 日至 8 月 30 日，第 1 天為報到與開幕式，後續 5 天為各式議題座談會、科研海報展覽交流及少數業者商品服務展覽，每日議程表定自上午 8 時 15 分開始至下午 6 時結束，議程如表 2(簡要版)與附件 1(詳細版)。

表 1、ICE2024 行程（7 日）

天數	日期	行程	備註
第 1 天	8/25 (日)	出發赴日及 ICE 大會報到	桃園－日本京都
第 2-6 天	8/26-8/30 (一)-(五)	參與 ICE2024 大會	詳如表 3
第 7 天	8/31 (六)	返回臺灣	日本京都－桃園

表 2、ICE2024 大會議程(簡要版)

<table>
<tr><th>時段</th><th>8/25（日）</th><th>8/26（一）</th><th>8/27（二）</th><th>8/28（三）</th><th>8/29（四）</th><th>8/30（五）</th></tr>
<tr><td>8:15</td><td rowspan="5">-</td><td>全體會議
主題：昆蟲與微生物共生之錯綜行為</td><td>全體會議
主題：昆蟲多樣性研究之新時代</td><td>全體會議
主題：食用昆蟲：前景與挑戰</td><td>全體會議
主題：瞭解入侵森林昆蟲之族群與行為生態學：永續害蟲管理之見解</td><td>全體會議
主題：肯亞觀點：擴大綜合監測以對抗蟲媒病毒之傳播及出現</td></tr>
<tr><td>9:00</td><td>茶敘</td><td>茶敘</td><td>茶敘</td><td>茶敘</td><td>茶敘</td></tr>
<tr><td>10:00</td><td rowspan="2">座談會
Mon 1</td><td rowspan="2">座談會
Tue 1</td><td rowspan="2">座談會
Wed 1</td><td rowspan="2">座談會
Thu 1</td><td rowspan="2">座談會
Fri 1</td></tr>
<tr><td>11:00</td></tr>
<tr><td>12:00</td><td rowspan="2">海報發表</td><td rowspan="2">海報發表</td><td rowspan="2">海報發表</td><td rowspan="2">海報發表</td><td rowspan="2">海報發表</td></tr>
<tr><td>13:00</td><td rowspan="3">報到</td></tr>
<tr><td>14:00</td><td rowspan="2">座談會
Mon 2</td><td rowspan="2">座談會
Tue 2</td><td>女性昆蟲學講座</td><td rowspan="2">座談會
Thu 2</td><td rowspan="2">座談會
Fri 2</td></tr>
<tr><td>15:00</td><td>開幕典禮</td><td>茶敘</td><td rowspan="4">公民教育活動</td></tr>
<tr><td></td><td>茶敘</td><td>茶敘</td><td>茶敘</td><td>茶敘</td><td>茶敘</td></tr>
<tr><td>16:00</td><td>Wigglesworth 紀念演講暨頒獎</td><td rowspan="3">座談會
Mon 3</td><td rowspan="3">座談會
Tue 3</td><td rowspan="3">座談會
Thu 3</td><td>特別電影</td></tr>
<tr><td>17:00</td><td>Filippo Silvestri 紀念演講暨頒獎</td><td>全體會議
主題：以自然為中心之角度向昆蟲智能學習</td></tr>
<tr><td></td><td>傑出獎項暨功績獎項頒獎典禮</td><td rowspan="2">-</td><td>閉幕式</td></tr>
<tr><td>18:00</td><td>接待宴</td><td>-</td><td>-</td><td>正式晚宴</td><td>閉幕宴</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></tr>
</table>

時段	8/25 (日)	8/26 (一)	8/27 (二)	8/28 (三)	8/29 (四)	8/30 (五)
19:00						
20:00	-					

本會議共安排 20 項主議題（表 3）研究成果交流座談會，各主議題又細分為 176 項子議題，其中與我國環境用藥管理較為相關之主議題包括遺傳學與基因組學(Genetics and Genomics)、醫學與獸醫昆蟲學(Medical and Veterinary Entomology)、害蟲管理(Pest Management)、除害劑、基因改造作物、抗藥性及毒理學(Pesticides, GM Crops, Resistance and Toxicology)等，爰以主議題為敘述主軸，彙整同行人員所參與之各項子議題研究座談內容，說明如下文。

表 3、ICE2024 研究成果主議題

項	主議題
1	Acarology and Arachnology(蜱蟎動物學與蛛形動物學)
2	Apiculture and Sericulture(養蜂與養蠶學)
3	Biological Control(生物防治)
4	Chemical Ecology(化學生態學)
5	Conservation, Biodiversity and Biogeography(保育、生物多樣性與生物地理學)
6	Development and Reproduction(發育與繁殖)
7	Ecology and Evolution(生態學與演化學)
8	**Genetics and Genomics(遺傳學與基因組學)**
9	Immunology and Pathology(免疫學與病理學)
10	Insect-Microbe Interactions(昆蟲與微生物互動學)
11	Insects as Food, Feed and Pollinators(作為食物、飼料與授粉者之昆蟲)
12	Alien Insect(外來昆蟲)
13	**Medical and Veterinary Entomology（醫學與獸醫昆蟲學）**
14	**Pest Management（害蟲管理）**
15	**Pesticides, GM Crops, Resistance and Toxicology（除害劑、基因改造作物、抗藥性與毒理學）**
16	Physiology, Neurobiology and Molecular Biology(生理學、神經生物學與分子生物學)
17	Social Insects(社會性昆蟲)
18	Systematics, Phylogeny and Morphology(系統分類、系統發育與形態學)
19	Special Issue: Biomimetics and Robotics(專題：仿生學與機器人學)
20	Others(其它)

表 4、同行人員名單

服務單位	姓名	職稱
環境部化學物質管理署	賴致勳	技士
環化有限公司	郭瑋軒	副理

圖 1、國立京都國際會館

圖 2、國立京都國際會館會場留影

圖 3、國立京都國際會館主會場

(一) 遺傳學與基因組學(Genetics and Genomics)

有關環境害蟲發生殺蟲劑抗藥性之原因大抵可分為四種機制，即有效成分目標結合位抗性(Target-site resistance, TR；如電壓門控鈉離子通道蛋白(Voltage-gated sodium channels)突變，有效成分不易建立鍵結，進而降低其感受性，此稱為 Knockdown resistance, kdr)、代謝抗性(Metabolic resistance, MR；如提高 Cytochrome P450、Esterases 及 Glutathione transferases, GST 等解毒酵素之反應速率)、穿透率抗性(Penetration resistance, PR；如改變外殼角質層構造，有效成分不易穿透)及行為抗性(Behavioral resistance, BR；如篩選出對有效成分感知性較高之品系，進而使其後代容易避開有效成分施用區)，以上抗性可能同時或單獨存在，而常作為環境用藥有效成分之除蟲菊精類(Pyrethroids)，目前在病媒蚊上觀測到的抗藥性機制主要為 TR 與 MR，另 TR 無法透過在殺蟲劑中添加協力劑(Synergist)克服，協力劑僅可應對 MR 造成之抗藥性問題。爰可利用次世代(基因)定序(Next Generation Sequencing, NGS)與環境 DNA(Environmental DNA, eDNA)檢驗技術廣泛調查特定區域之抗藥性基因盛行率，藉此調整相關病媒防治相關策略，惟基因檢測費用所費不貲，亦可待相關抗藥性基因體學研究齊備後，參考相關研究內容開發快速檢測套組，以降低檢驗成本並提供第一線用藥指引。

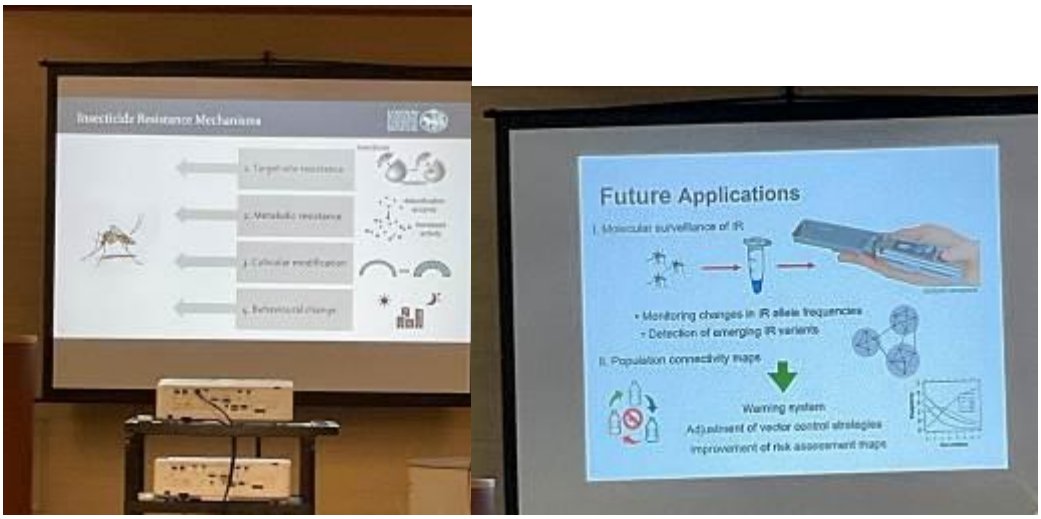

圖 4、抗藥性機制與 eDNA 檢驗應用說明簡報

(二) 醫學與獸醫昆蟲學（Medical and Veterinary Entomology）

1. 臭蟲防治管理

過去二十年，全球臭蟲復甦成為各國公共衛生之一大挑戰，而其復甦之示警最早可追溯至 2004 年，透過相關研究之發表，涵蓋當年於 ICE2004 上發表之研究，全球開始關注臭蟲再度成為一個重要蟲害問題之可能性。於 2006 年，研究首次發現臭蟲對多種殺蟲劑產生抗性，另於 2012 年發現單隻臭蟲即可引發感染之事實，表明臭蟲之復甦與其強大適應能力與對殺蟲劑產生之抗藥性存在密切關聯，因此產學研界開展許多針對臭蟲行為、抗藥性、及有效防治方法之研究。

有關臭蟲之抗藥性研究主要關注其對除蟲菊精類與有機磷類殺蟲劑之抵抗能力。日本研究指出，臭蟲之電壓門控鈉離子通道基因（如 kdr 基因）突變使其具備抵抗除蟲菊精類殺蟲劑之能力，而該突變可穩定傳遞至其子代，甚至在沒有殺蟲劑選汰壓力之情況下亦可保持穩定，意味抗藥性已成為臭蟲生存之適應優勢之一。此外，另有研究發現臭蟲體內共生菌可能在抗藥性機制上扮演重要角色，如某些共生菌能夠影響臭蟲對殺蟲劑之敏感性，當臭蟲體內的共生菌(如沃爾巴克氏體(Wolbachia)與耶爾森菌(Yersinia))經抗生素處理後，被β-變形菌、芽孢桿菌及放線菌所取代，導致臭蟲對殺蟲劑之感藥性顯著提高，此不失為新防治策略開發之新思路。

再者研究指出臭蟲之糞便點數量能夠做為感染源數量與環境污染程度之指標，透過量化糞便點，研究人員能夠更精確地預測感染範圍及群體規模，另可搭配 MALDI-TOF MS(基質輔助雷射脫附游離飛行時間質譜分析)鑑別溫帶臭蟲(*Cimex lectularius*)與熱帶臭蟲(*Cimex hemipterus*)，以釐清跨國入侵途徑，或定期使用臭蟲殘留物快篩試劑(側向流體免疫分析法, Lateral flow strip)進行監測，為臭蟲之入侵、檢測及防治提供可靠之數據支持，減少不必要之防治成本支出。

至於如何防治臭蟲，傳統上，殺蟲劑仍為主要手段，為應對臭蟲抗藥性之問題，目前業界已有研發出新產品，透過利用氣凝膠粉(Silica Aerogel powder)做為載體(粉劑係臭蟲防治策略中不可或缺之一環)，將丁烯羥酸內酯類藥劑(如 Flupyradifurone)與 Beta-賽扶寧(Beta-Cyfluthrin)做為有效成分進行混製(美

國環保署登記證號:101563-5)，研究指出具備良好成效。另應特別留意廢棄獨立空屋或低收入區域住宅之臭蟲入侵問題，研究指出使用硫醯氟(Sulfuryl fluoride, 如 Vikane®)進行薰蒸，存在有效殺滅對除蟲菊精類具抗藥性臭蟲之潛力，惟考量藥劑施用之風險，蒸氣處理與矽藻土防治經研究證實亦不失為替代方案，該研究顯示，蒸氣處理在短期內具有顯著之效果，而持續使用蒸氣或矽藻土則有助於長期減少熱帶臭蟲數量，藉此可減少化學品對環境之潛在污染，同時減少抗藥性臭蟲之生存機會。此外來自美國農業部之學者亦指出天然化合物苯甲酸甲酯(Methyl benzoate)具備做為替代殺臭蟲劑或驅避劑之潛力。

綜上所述，臭蟲復甦已成為全球公共衛生之重要課題，隨著臭蟲對殺蟲劑之抗藥性方興未艾，傳統化學防治手段之效果存在下降之風險，爰未來防治策略應更加注重精準用藥、新技術及非化學方法之開發，另需根據不同地理區域與品系之特點進行針對性設計。再者，臭蟲抗藥性機制之深入研究仍應持續推進，此將有助於擬定更具效率之防治策略。

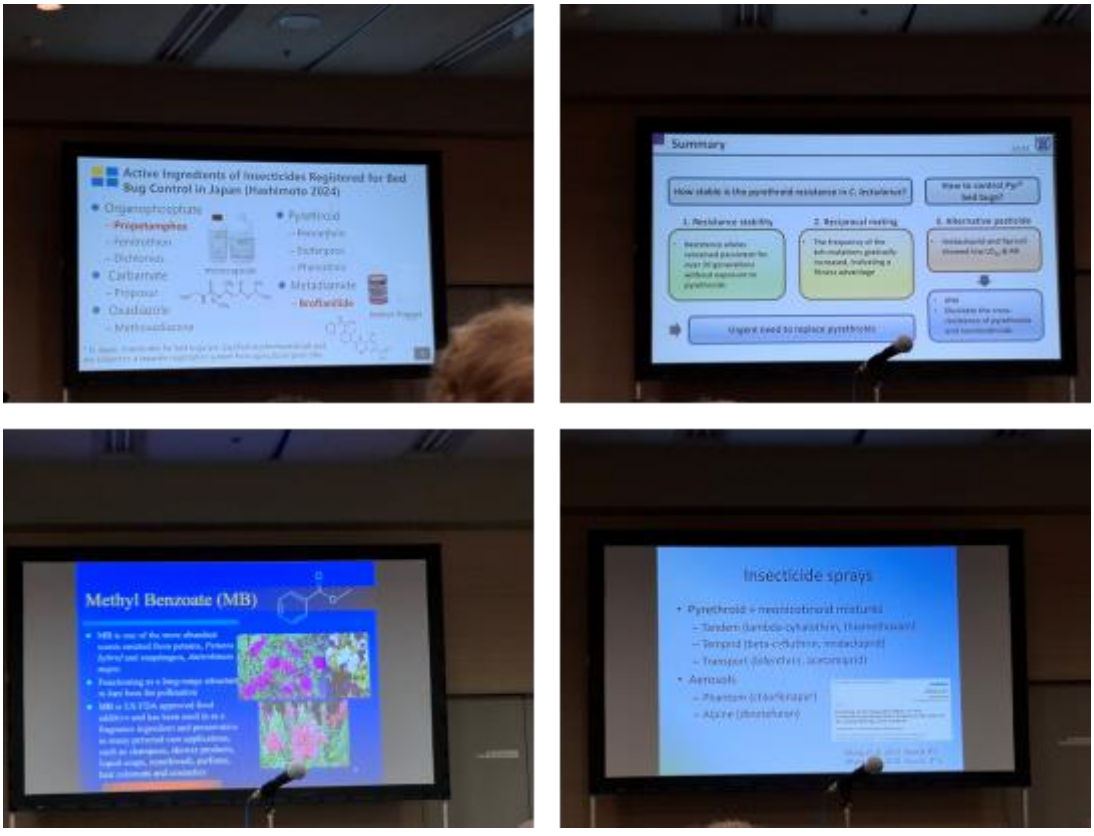

圖 5、臭蟲防治議題研究成果座談會部分簡報畫面

2. 病媒蚊管理

蚊子做為各類病毒(如登革熱病毒、茲卡病毒、屈公病病毒及日本腦炎病毒等)之載體，存在顯著之公共衛生風險，爰學者為控制蚊媒疾病，提出各種創新策略，如 In2Care 滅蚊陷阱，係結合蟲生真菌(Entomopathogenic fungus)與昆蟲生長調節劑(百利普芬, pyriproxyfen)，並利用埃及斑蚊之 skip-oviposition(不在單一位置產卵)之習性，形成透過蚊子傳播殺蟲劑之自動散佈站，藉此達到蚊群數量控制之效果，而在美國佛州之試驗顯示其能些微降低產卵密度，惟對成蚊密度之影響不顯著，顯示仍待進一步研究與改進。

再者利用基因工程技術(如 CRISPR/Cas、RNA interference, RNAi、透過基因驅動(Gene drive)建立 Super-mendelian inheritance 等)或不孕性昆蟲技術(Sterile Insect Technique, SIT)改變其族群性別比例、使其無法繁殖或遺傳高感藥性基因至子代之研究亦如火如荼開展，如我國臺灣大學醫學院蕭信宏教授根據蚊子帶原登革熱病毒後顯現之特定基因表現，設計特定基因片段編輯至蚊體內，藉此阻斷病毒顆粒之複製，或透過編輯蚊子感知外界訊息(人類汗水、蜜源及水源等)之神經元基因(如感知水源之 IR38a)，藉此干擾其產卵與吸血行為等，惟這類於實驗室培育出之蚊子，相較於野外品系更為脆弱，因此有研究說明應在野放之前進行環境調適(如氣溫、濕度等)，以達到預期之蚊群數量控制效果。另有學者考量基因編輯可能造成始料未及之後果，提供在基因編輯初始即加入自刪人工編輯基因之機制研究，降低試驗失控之風險。同時也有研究將利用基因工程技術設計出之基因片段視為藥品，利用 MGDrivE 3 (Mosquito Gene Drive Explorer 3)模型進行目標產品概述(Target Product Profile, TPP)，以評估其是否能在昆蟲學上達到預期之野外覆蓋率，而在流行病學上是否能達到減輕疫病(如瘧疾)傳播之成效，藉此調整試驗參數，並做為田野試驗之背景資訊，以最佳化產品效果。

此外日本學者發現越冬後之日本腦炎病毒主要病媒三斑家蚊(Culex tritaeniorhynchus)之顯現與日本櫻花花期高度連動，其背後機制與生育度數(growing-degree days)相關，即該蚊種須累積一定溫度後才會開始活躍，此可作為未來開發預警蚊蟲數量系統之參數依據。

最後美國辛辛納提大學學者與臺灣中興大學梁國汶副教授，亦示警與會者有關氣候變遷與不夠謹慎使用滅蚊化學藥劑可能造成之病媒蚊管理風險，即城市環

境中之蚊卵表現出較強之熱與脫水耐受性，與全球暖化之「城市熱島效應」，而這些特性可能有助於蚊子自森林環境轉移到城市居住，並增強其在極端氣候下之存活能力。而梁教授則指出傳統之滅蚊方法如殘效噴灑，經研究證實雖對瘧蚊數量控制有效，但對斑蚊之效果未有通盤之檢視，爰在本研究中發現班蚊可能存在遠離受藥物處理區域之傾向，導致其未能在預期時間內死亡，而部分倖存之班蚊在接觸化學藥劑(本研究使用第滅寧, Deltamethrin 與可尼丁,Clothianidin))後，其生殖能力反而增強，產卵數量增加，此即為毒物興奮效應(Hormesis)。倖存之班蚊後代甚至出現早期孵化與加速幼蟲發育之現象，此即為「跨代毒物興奮效應(Transgenerational hormetic effects)」；爰研究強調在蚊子防治中應注意此類現象，試圖尋求更有效之防制方法以應對此問題，而非僅依賴傳統化學藥劑進行防制。

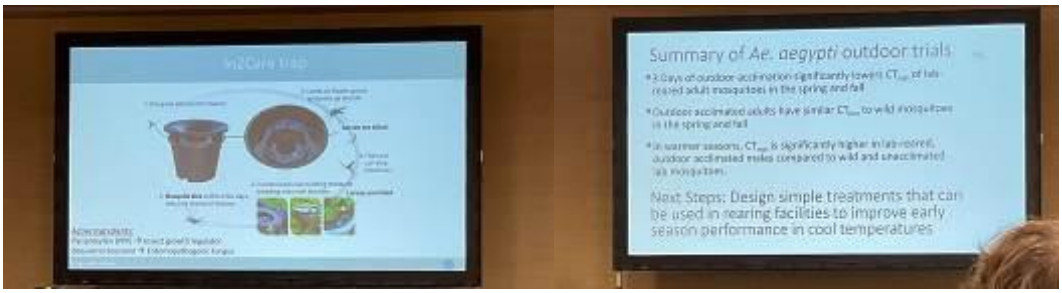

圖 6、病媒蚊管理研究成果座談會部分簡報畫面

3. 非病媒蚊之蟲媒議題

蟲媒疾病除了透過蚊子傳播外，如白蛉(Sandfly)與蜱蟲(Tick)等亦可傳播多種病原體(如病毒、細菌與原蟲等)，尤其在氣候變遷之影響下，可能改變蟲媒疾病傳播之慣性，如由白蛉(Sandfly)帶原利什曼原蟲造成之利什曼病，其中內臟利什曼病又被稱為黑熱病，該蟲媒經研究指出便會隨著氣溫調整其出沒時段，而臺灣白蛉族群雖以不吸食人血之應氏司蛉與鮑氏司蛉為主，惟仍存在可能傳播該疾病之江蘇白蛉，爰仍應留意該蟲媒之活躍情形。

此外在日本，隨著氣候變遷造成蜱蟲分布範圍擴大，導致過去不曾受影響之區域面臨更高之疾病(如萊姆病)傳播風險，再者近期於日本龜形花蜱(臺灣亦有分布)發現之新興 Oz 病毒造成之嚴重發熱伴血小板減少綜合症（Severe fever with thrombocytopenia syndrome, SFTSV）之案例，亦逐漸引起公共衛生界之關注，爰任職於輝瑞藥廠之研究員，便嘗試利用案例回報紀錄等資訊，透過 AI 輔助空間建模技術預測蜱蟲之分布變化，藉此提早發放萊姆病疫苗進行預防處置，其系統雖仍待實地田野調查驗證後才具顯著應用價值，惟已充分揭示結合 AI 進行蟲媒疾病預防工作之可能性。

(三) 害蟲管理（Pest Management）

伴隨氣候變遷與都市化之影響，政府應隨時留意環境衛生害蟲可能造成之公衛風險議題，若將公共衛生三段五級預防概念導入，施用環境用藥應屬次段與三段預防中的早期治療與避免事態惡化，而透過監測病媒發生情形以避免疫病發生則屬次段預防中之早期診斷，再者現代害蟲管理更須在環境友善與效率之間尋求平衡，以達到可永續經營之控制效果，因為傳統化學殺蟲劑雖然有效，但長期使用存在環境污染與發生抗藥性之風險，此促使產學研界之研究員嘗試尋找更為精準且安全之解決方案，其中即包含不孕性昆蟲技術(SIT)、基因驅動(Gene drive)、害蟲影像辨識及經驗動態建模(Empirical dynamic modeling, EDM)等技術，其中 SIT 與基因工程技術特別適用於繁殖力強、且對化學藥劑存在抗藥性之害蟲品系，提供降低害蟲數量，亦可減少害蟲對化學藥劑產生抗性之一防治手段。

SIT 係一種行之有年之害蟲控制方法，通過釋放經過不孕處理(如γ-ray 或 X-ray)之雄性昆蟲，使其與野外雌性交配，從而降低子代出生率，過去常見於農業害蟲防治，而目前應用於病媒蚊控制之潛力亦得到廣泛關注，如希臘研究呈現

SIT 應用於白線斑蚊（*Aedes albopictus*）族群控制之成功案例，惟其研究強調野放不孕雄蚊應注重品質管制(Quality control, QC)之檢核點(如運輸後之生存率、壽命、飛行能力與交配能力等)達成率，與釋放後捕捉以評估其餘命之重要性，藉此確保野放之不孕雄蚊能夠成功交配，以降低野生蚊群數量。而傳統 SIT 常面臨不孕處理之雄蟲生存能力較差之問題，常須依個案微調放射線劑量以達到預期之不孕效果，爰科學家嘗試將基因驅動技術結合至 SIT，如將雌性致死基因與基因驅動技術結合，藉此提高 SIT 之效率。

害蟲管理除了施用環境用藥杜絕病媒擴散外，前期之監測與預警亦相當重要，爰本國臺灣大學漁業科學研究所謝志豪教授即透過蒐集氣溫、降雨量、露點溫度及氣壓值等時間序列資訊，利用經驗動態建模(EDM) 建立蚊子數量預測模型，有助於在害蟲數量大發生事件前預先示警，此外日本環境機器株式會社(Semco Co.,Ltd.)亦與美國加州大學河濱分校學者共同開發 AI 辨識飛行害蟲儀器(Pest vision)，做為食品加工廠環境病媒監測之工具，以即時進行環境衛生排查或清消等處置。

本研討會主軸雖為昆蟲研究，惟昆蟲常作為病媒寄生於野生動物，如老鼠，爰主辦方亦安排一場有關日本老鼠防治之座談會，其中提及日本主要優勢鼠種為黑鼠（*Rattus rattus*, 亦稱屋頂鼠），美國與歐洲則以褐鼠（*Rattus norvegicus*, 亦稱溝鼠）為主，而控制日本黑鼠數量之困難點可能為，其對於抗凝血殺鼠劑存在抗藥性且較具警覺性，特別是都市區之黑鼠，甚至懂得跳離避開黏鼠板，另與歐美國家相比，具抗藥性之日本鼠類在 VKORC1(Vitamin K epoxide reductase complex 1, 維生素 K 環氧化物還原酵素)之基因突變位置不同，加上其解毒酵素(如 Cytochrome P450)活性增強等因素，導致控制其族群數更具挑戰性。

此外來自美國農業部之學者，提到美國亦有傾向不使用如敵避等化學藥劑驅趕蚊蟲之群眾，而近期研究發現椰子油中的中鏈脂肪酸(C10-C12)具備良好的昆蟲驅避性，將其做為含有 7%中鏈脂肪酸(C10-C12)之澱粉或果膠水溶劑，塗抹於體表，具備長效之防護效果，爰可做為綠色化學環境用藥開發之參考。

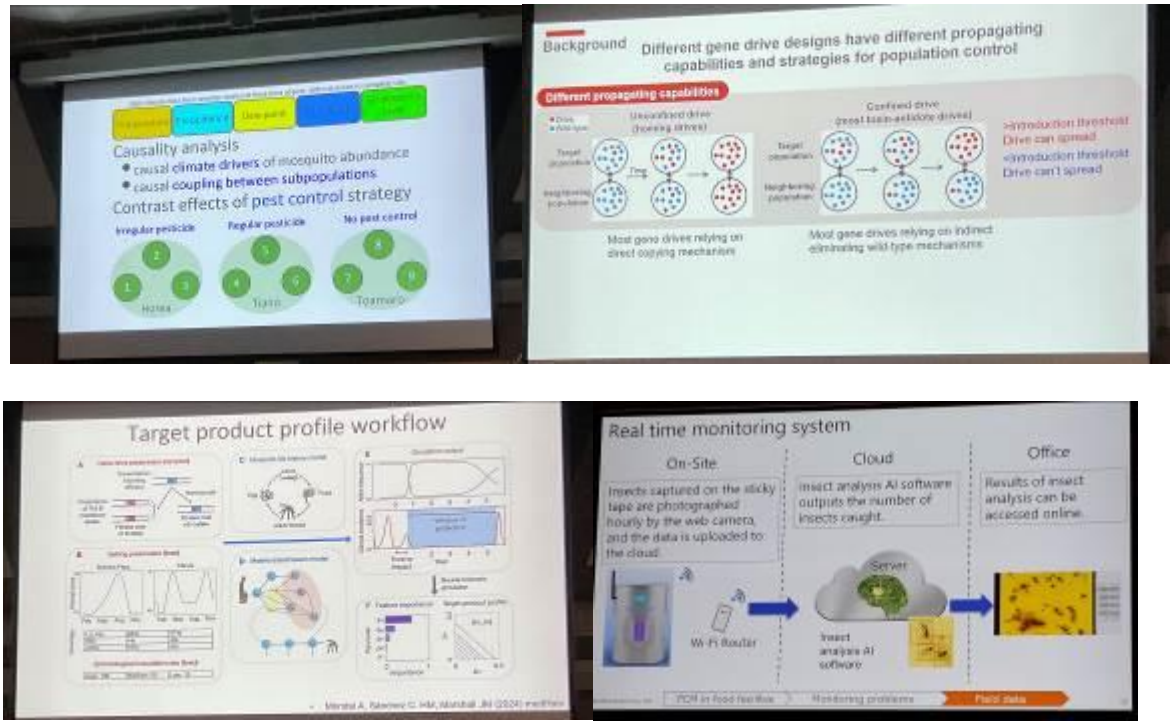

圖 7、害蟲管理研究成果座談會部分簡報畫面

(四) 除害劑、基因改造作物、抗藥性與毒理學（Pesticides, GM Crops, Resistance and Toxicology）

該主議題內容大抵與利用基因轉殖作物(如轉殖蘇力菌Bt蛋白之作物)抵禦農業害蟲有關，屬於與環境病媒較為相關之內容為，研究指出 ABC 轉運蛋白(ATP-binding cassette transporter, ABC transporter)做為蚊子血腦屏障之清毒工具，未來可針對其調整相關藥劑傳輸機制，如利用協同劑降低 ABC transporter 之工作機能，以提高藥效。

此外澳洲學者亦指出,低劑量殺蟲劑對昆蟲之亞致死效應(Sub-lethal effect)可能會促進抗藥性發展，即低劑量殺蟲劑對昆蟲造成氧化壓力、能量消耗與基因表達之改變，甚至神經退化病變，惟這類亞致死效應可能使昆蟲在未被殺滅之情況下產生選擇壓力，進而促進抗藥性基因在昆蟲族群中擴展。

三、心得及建議

本次 ICE2024 大會主題為「通過知識融通獲致之新發現(New discoveries through consilience)」，而從各座談會主題與其與談人數可知，有關基因編輯工程、人工智慧(AI)輔助辨識昆蟲及模型運算技術應用於害蟲管理之趨勢正在成形，因害蟲對於常用殺蟲劑有效成分(如除蟲菊精類、有機磷類及新菸鹼類等)產生抗藥性一事，始終為人類社會管理蟲媒之一大挑戰，惟透過基因編輯工程技術，得以讓研究者釐清抗藥性之癥結，據以設計能更有效殺滅害蟲之有效成分，或將其融入 SIT 技術，藉此達到控制蟲媒數量之效果，如美國環保署近年核准業界利用基因轉殖物質 tTAV-OX5034 作為有效成分，以進行埃及斑蚊防治之試驗研究，此外亦如國際 AI 晶片設計龍頭輝達(NVIDIA)執行長黃仁勳所言，結合 AI 技術之生技產業將大有可為，無論是用於高通量篩檢(High-throughput screening)協助開發新有效成分、建立害蟲影像辨識模型、結合經驗動態建模(EDM)建立害蟲數量預測模型，更甚是搭配基因驅動技術以模擬不孕雄蚊控制野外蚊群數量之效率等，以上發展願景皆已於本次研討會充分呈現，透過內化這類資訊並做為相關科技發展方向之風向球，將有助於我國制訂更為精準且有效之病媒防治策略，以精進環境衛生品質。

此外本研討會亦有開放少數空間供昆蟲業務(如害蟲防治、昆蟲監測、捕捉設備儀器等)相關業者設攤展覽，而日本環境用藥產業發展昌盛，臺灣市場許多環境用藥是自該國輸入，爰透過場邊對話，向日本環境用藥業者(地球製藥)請益該國環境用藥管理相關規定，對方指出該國環境用藥(Household pesticides)管理制度對外人而言不易理解，可概要說明如下，以殺鼠劑為例，視使用場域，可分為農藥(農薬, Pesticide)、防除用醫藥部外品(防除用医薬部外品, Quasi-drugs for pest control, 類似我國環境用藥)及動物用醫藥部外品(動物用医薬部外品, Quasi-drugs for animal use)，其中農藥(供農民用於作物園、果園、山林、穀倉及草地等)主管法規為農藥取締法，由農林水產省(類似我國農業部)審查，而防除用醫藥部外品(供民眾用於居家環境、公共場所與大樓等)與動物用醫藥部外品(供民眾用於家畜管理設施，如禽畜場所、附屬飼料倉庫及糞尿處理設施等)之主管法規為醫藥品醫療機器等法(簡稱藥機法，主管機關為厚生勞動省，類似我國衛福部與勞動部綜合機構)，惟防除用醫藥部外品係由厚生勞動省審查，動物用醫藥部外品則由農業部審查。再者農藥取締法規定未經農林水產省審驗許可之殺鼠劑不得用於農地，否則將面臨罰金與刑罰，爰鮮少誤用之情事，而目前亦少有 NGO

團體反映抗凝血殺鼠劑次級毒害之事件，因當前可做為防除用醫藥部外品之第二代抗凝血殺鼠劑僅有立滅鼠(Difethialone, 地球製藥係該有效成分產品許可證之唯一持有方)，而病媒防治業者大多會自主搭配餌盒使用，對方亦提及農藥並無第二代抗凝血殺鼠劑，另有撲滅鼠(Bromadiolone)登記做為動物用醫藥部外品，目前各環境用藥業者因政府不鼓勵引進新抗凝血殺鼠劑成分，爰各公司申請意願亦不高。在用藥選擇性被侷限的情況，日本仍能維持高水準之環境品質，連與會的歐美人士皆不敢置信日本都市會有鼠患問題，表示其整潔程度已到達瘋狂之層級，著實令人欽佩；實際就教業者，對方也認同應是力行環境整頓(如下水道系統、街道清掃等)與權責分明(如殺鼠劑有效成分差別化管理，並強化管理責任等)之制度奏效，所以才有此等成就，值得我國效法。

附錄

1.與會照片

<table>
<tr><td> 
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<tr><td>防治臭蟲產品攤位</td><td>日本環境用藥業者攤位</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>洽談日本環境用藥業者</td><td>臺灣昆蟲捕捉設備業者攤位</td></tr>
<tr><td>  </td><td></td></tr>
<tr><td>海報展示區一隅</td><td></td></tr>
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會場洽談人士名片

2.議程

Daily schedules

Sunday 25 August

Main Hall

Opening Ceremony 15:00 - 15:30

Award 16:00 - 16:45

The Wigglesworth Memorial Lecture and Award Ceremony

16:00 **AW1** Insect-Plant Interactions in the Anthropocene
May Berenbaum
University of Illinois Urbana-Champaign (United State of America)

Award 16:45 - 17:30

The Filippo Silvestri Memorial Lecture and Award Ceremony

16:45 **AF1** Benefits and Risks of Biological Control Introductions
George E. Heimpel
University of Minnesota (United State of America)

Award 17:30 - 18:00

Awards Ceremony for Certificate of Distinction and Certificate of Merit

[Certificates of Distinction Achievement Award]

A-CICE-01 Entomology beats lawn bowling
John H. Borden
Simon Fraser University (Canada)

A-CICE-02 Mosquitoes broadly rely on microbes for normal function.
Michael R. Strand
University of Georgia (United States of America)

A-CICE-03 RNAi and Bt approaches for insect pest control: advances, applications, and challenges
Maria Fatima Grossi-de-Sa
Embrapa Genetic Resources and Biotechnology (Brazil) / Catholic University of Brasilia (Brazil) / National Institute of Science and Technology, INCT PlantStress Biotech (Brazil)

A-CICE-04 Entomological needs in a bio-engineering faculty: from functional understanding to practical applications
Frederic Francis
University of Liege, Gembloux Agro-Bio Tech, Functional & Evolutionary Entomology (Belgium)

[Certificates of Merit (Mid-Career Award)]

A-CICE-05 Molecular and cellular basis of whitefly-bacteria symbiosis
Jun-Bo Luan
Shenyang Agricultural University (China)

A-CICE-06 Olfactory coding, processing and modulation in the insect brain
Silke Sachse
Max Planck Institute for Chemical Ecology, Research Group Olfactory Coding (Germany)

Monday 26 August

Main Hall

8:15 - 9:15

Plenary Lecture 1

8:15 **PL1** The Tangled Bank of Insect-Microbe Symbiosis
Nancy A. Moran
Department of Integrative Biology, The University of Texas at Austin (United States of America)

Introducer: Takema Fukatsu (National Institute of Advanced Industrial Science and Technology)

RoomA

Symposium 14-1

9:45 - 11:45

Potential application of Empirical Dynamic Modeling for insect population dynamics

Chair: Shigeki Kishi (National Agriculture and Food Research Organization), Noriyuki Suzuki (Kochi University)

9:45 **14-1-01** Introduction to EDM for entomologists
Shigeki Kishi

10:00 **14-1-02** Application of Empirical Dynamic Modeling for investigating environmental effects on mosquito population dynamics
Chih-hao Hsieh

10:15 **14-1-03** Multiple facets of the effects of interaction variability on population sensitivity to pesticide applications
Koya Hashimoto

10:30 **14-1-04** Nonlinear time series analysis on the interaction between the citrus whitefly and the whitefly-specialist ladybird as a test for top-down effect of biocontrol candidate
Noriyuki Suzuki

10:45 **14-1-05** EDM analyses for long rice pest records in Japan
Takehiko Yamanaka

11:00 **14-1-06** Iteratively forecasting the weekly Western Flower Thrips (*Frankliniella occidentalis*) population in a pepper greenhouse with a data-driven ensemble model
Kin Ho Chan

11:15 **14-1-07** Wave interference can disrupt tethered suppression gene drives in continuous space
Ruobing Feng

11:30 **14-1-08** Investigating the Termicidal effects of *Syzygium aromaticum* and *Allium sativum* Against the *Heterotermes indicola* (wasmann) (Isoptera: Rhinotermitidae)
Fazal Said

Symposium 14-2

13:30 - 18:15

Genetic Population Engineering for Pest Management

Chair: Jackson Champer (Peking University), Xuechun Feng (Shenzhen Bay Laboratory), Nicky Faber (Wageningen University & Research)

13:30 **14-2-01** Failure mode analysis for a genetic biocontrol technology
Michael J Smanski

13:45 **14-2-02** The impact of genetic diversity on gene drive efficiency in *Drosophila melanogaster*
Nicky Faber

14:00 **14-2-03** Gene drive based population suppression targeting *dsx* in the malaria vector *Anopheles stephensi*
Xuejiao Xu

14:15 **14-2-04** Male-only strains for genetic biocontrol of spotted wing Drosophila and the New World screwworm
Max Scott

14:30 **14-2-05** Genetic determinisms of *Wolbachia*-induced cytoplasmic incompatibility in the invasive pest, *Drosophila suzukii*
Nicolas O. Rode

14:45 **14-2-06** Modeling to support target product profiles for mosquito gene drives
John M. Marshall

15:00 **14-2-07** New germline Cas9 promoters show improved performance for homing gene drive
Jie Du

15:15 **14-2-08** Unravelling *Anopheles* mosquito embryogenesis and sex determination with long-read RNA sequencing
Matteo Vitale

15:30 **Coffee Break**

16:15 **14-2-09** Mosquito population modification and the malaria eradication agenda
Anthony A. James

16:30 **14-2-10** Genome engineering and gene drive development in the disease vector *Culex quinquefasciatus*
Xuechun Feng

16:45 **14-2-11** Improved population suppression by gene drive targeting *doublesex* from dominant nonfunctional resistance alleles
Weizhe Chen

17:00 **14-2-12** The expression of RTAcs-Bddisx system under thermo-control for female repression in *Bactrocera dorsalis*
Cheng Chang

17:15 **14-2-13** An integral gene drive for population modification of the malaria vector *Anopheles gambiae*
Nikolai Windbichler

17:30 **14-2-14** Spreading insecticide sensitive allele Rdl^{A301S} with gene drive in *Drosophila melanogaster*
Shimin Chen

17:45 **14-2-15** Allele Sails for Insect Population Modification
Maciej Maselko

Annex Hall1

Symposium 14-3

9:45 - 11:45

Sterile Insect Technique (SIT) Applications for Area-wide Integrated Pest Management (AW-IPM)

Chair: Lawrence Nkosikhona Malinga (South African Sugarcane Research Institute)

9:45 **14-3-01** Effect on sterility and flight ability of *Ceratitus capitata* irradiated with X-ray as an alternative to gamma irradiation for the sterile insect technique
Desmond Edward Conlong

10:00 **14-3-02** Applicability of Rhodamine-B for Mark, Release, and Recapture of Gamma-Irradiated Males *Aedes aegypti*: Persistence, Dispersal, and Its Effect on Survival
Beni Ernawan

10:15 **14-3-03** Experience and Lessons Learnt on the Application of SIT against the Primary Vector *Anopheles arabiensis* in South Africa
Givemore Munhenga

10:30 **14-3-04** Simulating Millions of Mosquitos Using Cutting Edge Continuous-Space Modeling Techniques
Samuel Evans Champer

10:45 **14-3-05** A Study in Ebony: Functional genomics evidence linking the *ebony* gene to the black pupae phenotype in tephritid fruit flies
Daniel Fernando Paulo

11:00 **14-3-06** Comparing gamma and X-ray irradiation for the sterilization of *Thaumatotibia leucotreta* in a commercial SIT programme
Megan Mulcahy

11:15 **14-3-07** Population suppression with dominant female-lethal alleles is boosted by homing gene drive
Jinyu Zhu

11:30 **14-3-08** Effect of X-ray irradiation on the sterility of Eldana saccharina for the sterile insect technique in sugarcane
Lawrence Nkosikhona Malinga

Symposium 14-4

13:30 - 18:15

Bemisia tabaci: a pernicious pest and a super vector

Chair: Rajagopalbabu Srinivasan (University of Georgia), Alvin M Simmons (Agricultural Research Service)

13:30 **14-4-01** Recent phylogenomic advancements, and biogeographical and ecological nuances of the *Bemisia tabaci* cryptic species group
Judith K Brown

13:45 **14-4-02** Whiteflies in Changing Environments
Alvin M Simmons

14:00 **14-4-03** Whitefly infestations may drop down under a future climate
Elisa Garzo

14:15 **14-4-04** The costs and benefits of two secondary symbionts in a whitefly host shape their differential prevalence in the field
Shu-Sheng Liu

14:30 **14-4-05** Horizontally obtained *Rickettsia* "symbiont" is not inherited by the parasitic wasp *Eretmocerus hayati*
Yin-Quan Liu

14:45 **14-4-06** Four decades of *Bemisia tabaci*-transmitted viruses in Europa's orchard
Dirk Janssen

15:00 **14-4-07** Alterations in the expression profiles of secreted small RNAs by the whitefly *Bemisia tabaci* upon Tomato yellow leaf curl virus infection
Murad Ghanim

15:15 **14-4-08** Differential interactions of *Bemisia tabaci* cryptic species with old- and new-world begomoviruses
Rajagopalbabu Srinivasan

13:45 **7-5-02** Reevaluation of exclusion due to resource competition for food among herbivorous insects using leaf beetle species
Natsuki Nomura

14:00 **7-5-03** Architecture, construction, retention, and repair of fecal shields in three tribes of tortoise beetles (Chrysomelidae: Cassidinae)
Caroline Simmrita Chaboo

14:15 **7-5-04** Evolutionary scenarios for reduction of the hindwings of Galerucinae sensu strico (Coleoptera: Chrysomelidae): cases of Taiwanese species
Chi-Feng Lee

14:30 **7-5-05** Genomic basis of digestive synergy in a leaf beetle-bacterial symbiosis
Hassan Salem

14:45 **7-5-06** Developmental process of elytral spines in leaf beetles
Tadashi Shinohara

15:00 **7-5-07** How do female and male genitalia interact mechanically in *Cassida* beetles with an elongated intromittent structure?
Yoko Matsumura

15:15 **7-5-08** Aedeagal sensilla of *Agelastica alni* (Coleoptera: Chrysomelidae: Galerucinae)
Michael Schmitt

15:30 **Coffee Break**

16:15 **7-5-09** Exploring white mustard (*Sinapis alba*) diversity for novel resistance against the Cabbage Stem Flea Beetle (*Psylliodes chrysocephala*).
Susannah Gill

16:30 **7-5-10** An outline of history and current status in studies of the Japanese fauna of the family Chrysomelidae (Coleoptera)
Kunio Suzuki

16:45 **7-5-11** Moss and leaf-litter inhabiting leaf beetles of Japan (Coleoptera: Chrysomelidae: Galerucinae)
Haruki Suenaga

17:00 **7-5-12** Introduction to taxonomic issues within the Japanese members of the genus *Chrysolina* (Coleoptera: Chrysomelidae: Chrysomelinae)
Takuya Takemoto

17:15 **7-5-13** Taxonomic study on the *Basilepta hirticollis* species-group (Coleoptera, Chrysomelidae, Eumolpinae) from Japan
Hiroaki Shigetoh

17:30 **7-5-14** Resurrection of *Donacoia*, and endophallite structure of Donaciinae.
Ingolf S Askevold

17:45 **7-5-15** Rediscovery of a Second Reed Beetle in Israel
David Furth

18:00 **7-5-16** Museum collections are the most important basis for studying Donaciinae
Elisabeth Geiser

Room D

Symposium 16-1

9:45 - 11:45

Physiology of insects in a warming world: from cellular to ecological and evolutionary responses

Chair: Nicolas Pichaud (Université de Moncton), Jon F Harrison (Arizona State University), Daniel González-Tokman (Instituto de Ecología AC)

9:45 **16-1-01** The role of phenotypic plasticity in shaping evolutionary responses to climate change
Vanessa Kellermann

10:00 **16-1-02** Insect Responses to Extreme High Temperatures under climate warming
Chun-Sen Ma

10:15 **16-1-03** Testing the threshold trait model to predict plasticity of flight dimorphism in *Gryllus* field crickets
Lourenço Martins

10:30 **16-1-04** Temperature effects on performance of Triatomine as Chagas disease vectors
Sabrina Clavijo-Baquet

10:45 **16-1-05** Oxidative stress in insects in times of global change.
Daniel González-Tokman

11:00 **16-1-06** Surviving the heat: An investigation of the Heat Shock Response in three *Polistes* species from different climates
Astrid Bay Amstrup

11:15 **16-1-07** Honey bees in the desert summer: a comfortable dry heat or deadly oven?
Jon F Harrison

11:30 **16-1-08** Solar radiation alters heat balance and thermoregulation in a flying desert bee
Meredith Grace Johnson

10:45 **2-1-05** Aiming at building the better strains of the honey bee *Apis mellifera*
Shotaro Mine

11:00 **2-1-06** Genome analysis of the pupal parasitoid of the stable fly, *Spalangia cameroni* (Hymenoptera: Spalangiidae)
Hiromitsu Araki

11:15 **2-1-07** New high-quality genome assembly and annotation for the imperiled Loammi skipper butterfly (*Atrytonopsis loammi*)
Rachel L Walsh

11:30 **2-1-08** Genome sequencing revealed the pseudogenization of visual genes in trechine beetles living in caves
Takuma Niida

Symposium 15-1

13:30 - 18:15

Transitioning Insecticide Science Technologies for the Development of Novel Chemistries

Chair: Daniel Swale (University of Florida), Troy D Anderson (University of Nebraska), Yoshihisa Ozoe (Shimane University)

13:30 **15-1-01** Interaction of recombinantly expressed fall armyworm ABCC2 variants with Bt Cry toxins unveils resistance mutations in extracellular loops impairing pore formation
Ralf Nauen

14:00 **15-1-02** Estimation of the mode of action of a new insecticide candidate, NNI-2101, by using the genomic analysis of the mutant *Caenorhabditis elegans*
Motofumi Nakano

14:15 **15-1-03** Pyrethrins act as feeding deterrents by irritating the insect oral taste organs through the intrinsic neurotoxic actions
Takeshi Kojima

14:30 **15-1-04** Verification of the binding site of fluralaner in vivo using CRISPR/Cas9
Chunqing Zhao

14:45 **15-1-05** Chordotonal organ modulators as insecticides and beyond
Jia Huang

15:00 **15-1-06** The Mode of Action of Insecticidal Alkylsulfones
Andrew James Crossthwaite

15:15 **15-1-07** Molecular understanding of target site actions of neonicotinoid insecticides
Kazuhiko Matsuda

15:30 **Coffee Break**

16:15 **15-1-08** Functional in vivo tools for the characterization of novel targets and the development of selective insecticides
Stefanos Mastis

16:30 **15-1-09** Functionality of mosquito ABC transporters and strategies to improve insecticide delivery
Troy D Anderson

16:45 **15-1-10** Development of novel mechanism aphicides to prevent horizontal transmission of non-persistent plant pathogens
Daniel Swale

17:00 **15-1-11** Exploring cys-loop ligand-gated ion channels, superfamilies of pesticide targets
Andrew Jones

17:15 **15-1-12** Molecular mechanisms of gene expression variation associated with resistance in a polyphagous pest
Thomas Van Leeuwen

17:30 **15-1-13** Identification and characterization of cytochrome p450s putatively associated with fluvalinate resistance in *Varroa* mites
Si Hyeock Lee

17:45 **15-1-14** The genomics of adaptation to natural and synthetic xenobiotics in the aphid *Myzus persicae*
Chris Bass

18:00 **15-1-15** Identifying determinants of the antagonism of γ-aminobutyric acid-gated chloride channels by fluralaner
Yoshihisa Ozoe

Room G

Symposium 20-1

9:45 - 11:45

ad hoc session

Chair: Aleksandra Janiszewska (University of Lodz), Vazrick Nazari (University of Padova)

9:45 **20-1-01** Entomological knowledge in ancient Mesopotamia
Vazrick Nazari

10:00 **20-1-02** Calorimetry-Assisted Degree Day Modeling
Lisa G Neven

10:15 **20-1-03** Electromagnetic Wave Simulation in Insects: A Computed Tomography (CT) Data Approach
Felipe Oliveira Ribas

10:30 **20-1-04** Australian Cercopoid Phenology in a Biosecurity Context
Cait Jade Selleck

10:45 **20-1-05** Determining plant hosts of chilli thrips during summer in Florida woodlands
Chastity L Perry

11:00 **20-1-06** Adaptation of stonefly (Plecoptera) life cycle to water temperatures-egg stage-
Mayumi Yoshimura

11:15 **20-1-07** Factors determining the occurrence of polyxenic ectoparasite in birds inhabiting different ecological niches
Aleksandra Janiszewska

11:30 **20-1-08** Vertical stratification in forest arthropod abundance and diversity: From local food preference in ants to global patterns across major arthropod taxa
Benjamin David Blanchard

Symposium 15-2

13:30 - 18:15

Bioinspired pest control

Chair: Martin G Edwards (Newcastle University), Joerg Romeis (Agroscope)

13:30 **15-2-01** Insect multitrophic interactions for bionspired plant protection
Francesco Pennacchio

14:00 **15-2-02** Present global status of Bt plants and future improvements
Sergey Ivashuta

14:15 **15-2-03** Dimpropyridaz (Axalion®): a chordotonal organ modulator with a new mode of action
Barbara Wedel

14:30 **15-2-04** Decreased electrophysiological responses to essential oils based on gustatory habituation in *Spodoptera litura*
Hyoeun Jeon

14:45 **15-2-05** Sublethal Effects of Philippine Actinomycete Strain, *Streptomyces angustmyceticus* CGS B11, against *Aedes aegypti* (Diptera: Culicidae)
Kathleen T. Dizon

15:00 **15-2-06** Nanocarrier mediated delivery of insecticides into tarsi enhances insect mortality
Juan Pablo Giraldo

15:15 **15-2-07** *Wolbachia* wisdom: Unleashing CifAB cytoplasmic incompatibility for confined gene drives in mosquitoes
Carol Li

15:30 **Coffee Break**

16:15 **15-2-08** Assessing environmental risks of synthetic gene drives
Joerg Romeis

16:30 **15-2-09** Species-selective agonists of juvenile hormone receptor - en route to environmentally friendly IGRs
David Sedlak

16:45 **15-2-10** Developing pest-resistant plants through genome editing
Angharad Margaret Roscoe Gatehouse

17:00 **15-2-11** RNAi-based biological control as a promising strategy for sucking pests management
Jinzhi Niu

17:15 **15-2-12** From Genes to Fields: A Role for RNAi in IPM and Sustainable Agriculture
Martin G Edwards

17:30 **15-2-13** Unique P450 genes are evolved for the drive of cross resistance in field generalist pests
Sichun Zheng

17:45 **15-2-14** MicroRNA-mediated insecticide resistance in *Spodoptera frugiperda*: Unraveling the role in chlorantraniliprole susceptibility
Rashmi Manohar Mahalle

18:00 **15-2-15** RNAi-based biopesticides against the 28-spotted ladybeetle *Henosepilachna vigintioctopunctata*
Huipeng Pan

15:30 **Coffee Break**

16:15 **3-2-09** Presentation Withdrawn

16:30 **3-2-10** Classical biological control of BMSB in apple orchard; a successful story?
Claudio Ioriatti

16:45 **3-2-11** Classical biological control of orange spiny whitefly *Aleurocanthus spiniferus* in Greece
Maria Vasiliki Giakoumaki

17:00 **3-2-12** Classical biological control of *Torymoyella parvicornis*: challenges and perspectives for a potential candidate
Lucrezia Giovannini

17:15 **3-2-13** Next steps for biological control of insects pests in Canadian Prairie field crops
Haley Catton

17:30 **3-2-14** Prioritising Australian scale insects for prey-specificity testing of *Neoleucopis* spp, potential biological control agents of giant pine scale.
Umar Kombo Lubanga

17:45 **3-2-15** Survey of native egg parasitoid and its variation to the invasive litchi stink bug, *Tessaratoma papillosa*, in the orchards of southern Taiwan.
Chun-Chun Chang

18:00 **3-2-16** Shoot the Moon: current situation in biological control and new technologies for genetic improvement of biological control agents
Norihide Hinomoto

Room I

Symposium 13-1 — 9:45 - 11:45

Ecology of biting flies: development of new control strategies

Chair: Gerard Duvallet (University Paul-Valery Montpellier3), Theeraphap Charoenwiriyapap (Kasetsart University)

9:45 **13-1-01** Relationship between flight activity of the stable fly, *Stomoxys calcitrans* (Diptera: Muscidae) and evasive behavior of cattle
Tatsuo Fujioka

10:00 **13-1-02** Paint it black: The relative importance of reflective intensity, colour, and polarization for stable fly attraction
Emmanuel Hung

10:15 **13-1-03** Spatio-temporal Distribution of Stomoxys species in Beef Farms, Bangkok, Thailand
Ratchadawan Ngoenklan

10:30 **13-1-04** Lethal toxicity of native botanical insecticides for control of *Stomoxys* spp. (Diptera: Muscidae) in Thailand
Krajana Tainchum

10:45 **13-1-05** Stable fly management: a new IPM approach tested at a Donkey Sanctuary in Spain
Gerard Duvallet

11:00 **13-1-06** House fly behavioral resistance: current understanding, challenges, and future directions
Amy Murillo

11:15 **13-1-07** Detection of *Leucocytozoon* in black fly, *Simulium chumpornense* and biting midges, *Culicoides peregrinus* from southern Thailand
Sorawat Thongsahuan

11:30 **13-1-08** Short-range attraction, landing, and post-landing behaviour of host-seeking *Anopheles* mosquitoes: implications for malaria vector control tools
Manuela Carnaghi

Symposium 13-2 — 13:30 - 18:15

The Global Bed Bug Resurgence, 20 Years On

Chair: Stephen Lindsay Doggett (NSW Health Pathology), Dini Michele Miller (Virginia Tech University)

13:30 **13-2-01** 20 Years of Research in the Global Bed Bug Resurgence
Stephen Lindsay Doggett

14:00 **13-2-02** Evolution of Bed Bug Standard of Care Through a Litigation Review
Jeffrey M Lipman

14:15 **13-2-03** Efficiency of MALDI-TOF MS at identifying *Cimex* bedbugs and discriminating immature stages
Philippe Parola

14:30 **13-2-04** Bed bug (*Cimex lectularius* L.) fecal spot production as a measure of envrionmental contamination and population size.
Dini Michele Miller

14:45 **13-2-05** Insights into the immune transcriptome of the common bed bug, *Cimex lectularius*: tissue-specific transcriptomic profiles and responses to pathogens
Sanam Meradj

15:00 **13-2-06** Symbiont-mediated insecticide tolerance in the tropical bed bug, *Cimex hemipterus*
Veera Singham K Genasan

15:15 **13-2-07** Bed bugs resistant to pyrethroids or organophosphates in Japan
Osamu Komagata

15:30 **Coffee Break**

16:15 **13-2-08** Stability of *kdr* mutations of voltage-sensitive sodium channel gene in the common bed bug, *Cimex lectularius*
Susie Cho

16:30 **13-2-09** 8 years in public housing, Oslo, Norway. What we learned about bed bugs
Espen Roligheten

16:45 **13-2-10** Twenty years after bed bug resurgence in low-income housing: Effective management strategies and challenges in the U.S.
Changlu Wang

17:00 **13-2-11** Research in Repellents against *Cimex lectularius*
Aijun Zhang

17:15 **13-2-12** Bed bug detection and control: Lab and field evaluation of a lateral flow strip for bed bug detection and a new insecticidal dust for pest management
Alexander Ko

17:30 **13-2-13** Control Efficacy of Steam and Diatomaceous Earth Dust Against Tropical Bed Bug, *Cimex hemipterus* (F.)
Desen Wang

17:45 **13-2-14** Evaluation of Vikane® Fumigation for Tape-and-Sealed and Tarped Structures to Determine the Cost of Bed Bug Elimination (*Cimex lectularius* L.) in Single Family Homes
Morgan M. Wilson

18:00 **13-2-15** The impact of independent insecticide efficacy studies on defining best practice for pest managers undertaking bed bug elimination services
David Lilly

Room J

Symposium 5-1

9:45 - 11:45

Long-term perspectives: Quaternary & Archaeological Entomology

Chair: Michael A. Monzon (Rutgers, the State University of New Jersey), Lauren M Weidner (Arizona State University), Philip Iain Buckland (Umeå University)

9:45 **5-1-01** Archaeoentomology and the Columbian Exchange: the transformation of the North American Insect Fauna during the Colonial Period.
Allison Bain

10:15 **5-1-02** History and Prospects of Quaternary Entomology in Japan
Shigehiko Shiyake

10:30 **5-1-03** Entomological Time Travel: application imaging methods in paleoentomology
Agnieszka Soszynska

10:45 **5-1-04** Early Holocene environments in northern Sweden: landscape transformation on local and regional scales
Love Eriksson

11:00 **5-1-05** AI as a Catalyst in Entomological Research by Simplifying Species Identification
Hossein Shirali

11:15 **5-1-06** Neotropical paleoclimate, Andean orogeny, and the Isthmus of Panama: UCEs illuminate the evolution of the "pyramid ants" (Formicidae: *Dorymyrmex*)
Jill T Oberski

11:30 **5-1-07** Big Data and Fossil Insects for studying climates, environments and human impact
Philip Iain Buckland

Symposium 5-2

13:30 - 15:30

ad hoc session

Chair: Marija Ivković (University of Zagreb), Rasmus Erlandsson (Stockholm University)

13:30 **5-2-01** Climate-driven changes and lessons from long term research: Diptera species turnover and dominance shifts
Marija Ivković

13:45 **5-2-02** Coleoptera species diversity in two tropical deciduous forests in Mexico based on metagenetic data
Diana Patricia Zavala-De La Rosa

14:00 **5-2-03** Detection of recent temporal change in genetic diversity and structure for a population of endangered butterfly, *Luehdorfia japonica*
Shouhei Ueda

14:15 **5-2-04** Preliminary comparative evaluation of eDNA as a tool for odonate diversity assessment in different biogeographic regions
Rhema Uche-Dike

10:45 **12-1-05** Asymmetrical introductions between Europe and China of non-native insects associated with woody plants
Alain Roques

11:00 **12-1-06** Why so many Hemiptera invasions?
Andrew M Liebhold

11:15 **12-1-07** Evolution as the weakness of an empire: Isolation and new introductions as disruptors of the invasiveness of Argentine ants in Europe.
Iago Sanmartin-Villar

11:30 **12-1-08** Genomic insights from the recent American invasion of Lebbeck Mealybug offers clues to its global success
Tracy Erin Liesenfelt

Symposium 12-2

13:30 - 15:30

Alien Pest Invasions: Strategies for Managing New Pest Introductions Driven by Trade, Travel, and Climate Change

Chair: Yu Takeuchi (North Carolina State University), Godshen Pallipparambil Robert (North Carolina State University)

13:30 **12-2-01** Collaborating with industry to facilitate safe international trade
Lauren E Quevillon

13:45 **12-2-02** Are interception records in ports and airports potential predictors of establishment of exotic insect pests in France?
Philippe Reynaud

14:00 **12-2-03** Analysis of Quarantine Forest Pest Monitoring Techniques and Results in Croatia: A Five-Year Synopsis
Nikola Zorić

14:15 **12-2-04** Developing decision support systems and frameworks for tracking non-native pests
Godshen Pallipparambil Robert

14:30 **12-2-05** A quantitative pest risk assessment of the shoot and fruit borer, *Leucinodes orbonalis* Guenée (Lepidoptera: Crambidae), for the European Union
Ewelina Barbara Czwienczek

14:45 **12-2-06** Combining climatic and host data to predict establishment risk of a frequent invader, the Japanese cedar longhorned beetle
Kristy M McAndrew

15:00 **12-2-07** Predicting the distribution of twelve invasive termites under climate change and urbanization: a socioeconomic perspective
Edouard Duquesne

15:15 **12-2-08** Investigating the impacts and adaptation strategies and current and emerging agricultural pests in the face of climate change
Yu Takeuchi

Symposium 8-2

16:15 - 18:15

Advancing vector borne diseases identification, incrimination and control in the genomics era.

Chair: Emma Louise Collins (London School of Hygiene and Tropical Medicine), Matthew Higgins (London School of Hygiene and Tropical Medicine), Grayson Brown (Puerto Rico Science, Technology, and Research Trust)

16:15 **8-2-01** Using genomics to inform vector borne disease programmes
Susana Campino

16:30 **8-2-02** Utilising worldwide comparative genomics to explore insecticide resistance in Aedes aegypti
Emma Louise Collins

16:45 **8-2-03** "Resistance is futile…or is it?": the impact of next-generation malaria vector control tools on the evolution of insecticide resistance
Louisa Alexandra Messenger

17:00 **8-2-04** The Use of Genomic Information on Insecticide Resistance in Applied Vector Management Programs
Grayson Brown

17:15 **8-2-05** Population genetics of insecticide resistance in the *Culex pipiens* complex within the USA
Andrea Gloria-Soria

17:30 **8-2-06** Sequencing and bioinformatics pipelines for the detection of molecular markers of acaricide resistance in ticks
Jordan T Bird

17:45 **8-2-07** In-trap DNA contamination: tsetse (*Glossina* sp.) xenomonitoring methods can result in over-estimates of *Trypanosoma brucei* infection
Isabel Saldanha

18:00 **8-2-08** Identification and characterization of densovirus endogenous sequences in the whitefly *Bemisia tabaci*
Kai-Heng Wei

Tuesday 27 August

Main Hall

8:15 - 9:15

Plenary Lecture 2

8:15 **PL2** A New Era of Insect Diversity Research
Fredrik Ronquist
Department of Bioinformatics and Genetics, Swedish Museum of Natural History (Sweden) / Department of Zoology, Stockholm University (Sweden)

Introducer: Yoshihisa Abe (Kyushu University)

RoomA

Symposium 14-6

9:45 - 11:45

Tackling destructive forest pests: sharing lessons for the future

Chair: Daegan Inward (Forest Research)

9:45 **14-6-01** Insect pests of plantation forests in sub-Saharan Africa: Challenges and prospects for pest surveillance and management
Brett Hurley

10:00 **14-6-02** Fluctuating Temperatures as a Predictor of Eastern Spruce Budworm Outbreaks
Emily Black

10:15 **14-6-03** Laurel wilt: an ambrosia beetle transmitted disease impacting avocados
Daniel Carrillo

10:30 **14-6-04** Multinational investigations into the long-distance spread of a tree-killing bark beetle and the susceptibility of a novel host tree
Daegan Inward

10:45 **14-6-05** Ecological Self-Control Technology for *Anoplophora glabripennis* Disasters
Youqing Luo

11:00 **14-6-06** Trapping *Hylobius abietis* – an alternative to the use of insecticides
Michael Gunter Müller

11:15 **14-6-07** Using pheromone and smart traps to control *Lymantria dispar* in European countries
Paraskevi Agrafioti

11:30 **14-6-08** How taxonomy of invertebrates can be supported by AI and automation with bark beetles as an example
Christian Pylatiuk

Symposium 14-7

13:30 - 18:15

IPM of Invasive Insect Pests in the Specialty Crops under the Changing Climate Patterns

Chair: Muhammad Haseeb (Florida Agricultural and Mechanical University), Youichi Kobori (Japan International Research Center for Agricultural Sciences), Jawwad Qureshi (University of Florida), Lambert Kanga (Florida A&M University)

13:30 **14-7-01** Method for artificial inducing egg-laying in tomato leafminer, Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae)
Gaku Akiduki

13:45 **14-7-02** Lesser Clover Leaf Weevil (*Hypera nigrirostris* Fab.) in Red Clover Seed Production: Scouting, Economic Thresholds, and Sequential Sampling Plans
Jeremy Irvine

14:00 **14-7-03** Progress toward biological control of *Drosophila suzukii*, a keystone invasive pest of small and stone fruits in the United States
Ashfaq Sial

14:15 **14-7-04** Can an Integrated Pest Management Approach assist the control of Varroa mite in Australia?
Mary Whitehouse

14:30 **14-7-05** Insecticide Resistance in the Small Hive Beetle, *Aethina tumida* Murray (Coleoptera: Nitidulidae) in Honeybee Colonies, Mechanisms and Management of Resistance
Lambert Kanga

14:45 **14-7-06** Impact of temperature on development and reproduction of Asian Citrus Psyllid, *Diaphorina citri* Kuwayama
Jawwad Qureshi

Symposium 14-10

13:30 - 18:15

Development and application of baits for subterranean termite control in the last three decades

Chair: Nan-Yao Su (University of Florida), Chow-Yang Lee (University of California, Riverside), Thomas Chouvenc (University of Florida)

13:30 **14-10-01** An overview of the development of termite baits in the past three decades
Nan-Yao Su

13:45 **14-10-02** History and Success of the Sentricon® System from an R&D and Commercial Perspective
Garima Kakkar

14:00 **14-10-03** Subterranean termites colony demography and biology and their role in the successful implementation of baits
Thomas Chouvenc

14:15 **14-10-04** Casting termite tunnels to understand how termites approach and establish foraging in resources
Mark Janowiecki

14:30 **14-10-05** The potential of 20-hydroxyecdysone to accelerate termite baiting programs
Sang-Bin Lee

14:45 **14-10-06** Population management of subterranean termites of the genus *Reticulitermes* (Blattodea: Rhinotermitidae) in urban areas of Spain
David Hernández-Teixidor

15:00 **14-10-07** Sentricon® Project, Chatsworth, California, USA: performance and lessons learned.
Presenter: Vernard Lewis
Vernard Richard Lewis

15:15 **14-10-08** The New Orleans French Quarter after Operation Full Stop: Where are we Today?
Carrie Cottone

15:30 **Coffee Break**

16:15 **14-10-09** A brief history of chlorfluazuron termite bait in Asia-Pacific
Partho Pratim Dhang

16:30 **14-10-10** 25-year of termite baiting and the change of the landscape of pest management industry in Southeast Asia
Chow-Yang Lee

16:45 **14-10-11** Challenges in baiting to manage fungus-growing termite colonies
Hou-Feng Li

17:00 **14-10-12** Development of termite baiting in Australia and the evolving market.
Donald Ewart

17:15 **14-10-13** Discovery of an underground chamber to protect kings and queens during winter in temperate termites
Mamoru Takata

17:30 **14-10-14** Exploring the gut microbiome of *Cryptotermes brevis*: adaptive changes to diet and life stage disparity
Will Haigh

17:45 **14-10-15** Molecular basis of driving social immunity in termites
Qiuying Huang

18:00 **14-10-16** Is there a convergence in the molecular mechanisms involved in subsocial behavior in cockroaches ?
Juliette berger

Room C-1

Symposium 7-7

9:45 - 11:45

Novel Interspecific Relationships Mediated by Trace Chemicals

Chair: Shiori Kinto (Kyoto University)

9:45 **7-7-01** Tiny mites avoid caterpillar traces to prevent incidental non-cascading predation
Shiori Kinto

10:15 **7-7-02** Footprints speak louder than words: Avoiding ant encounters based on chemical traces
Toshiharu Akino

10:30 **7-7-03** Avoidance of ant traces by agriculture mites
Shuichi Yano

10:45 **7-7-04** Presentation Withdrawn

11:00 **7-7-05** Odour marks at food sources and interactions between native and introduced bees
Rosalyn Gloag

11:15 **7-7-06** Olfactory-driven Predatory Strategies Propel *Spodoptera frugiperda*'s Triumph in Ecological Niche Competition Among Indigenous Pests
Bin Yang

11:30 **7-7-07** Genetics, behavior, chemical recognition and gut microbiota of the globally invasive ant *Pheidole megacephala* in Taiwan
Yu-Cheng Chiu

Room G

Symposium 2-2

9:45 - 11:45

Recent Advances in Basic and Applied Studies on Wild Silkworms and Silk in the World

Chair: Jun Kobayashi (Yamaguchi University), Michal Zurovec (Biology Centre CAS)

9:45 **2-2-01** Tracing the evolution of silk from molecules to genes
Michal Zurovec

10:00 **2-2-02** On the wild ancestor of Chinese oak silkworm *Antheraea pernyi*
Yanqun Liu

10:15 **2-2-03** Breeding muga silkworms (*Antheraea assamensis*): Lesson learned
Kallare P Arun Kumar

10:30 **2-2-04** Artificially Reeled Gonometa Silk fibers
Everlyn Nguku

10:45 **2-2-05** Structurally and mechanically robust silk fibers spun from silkworms and spiders regardless of reeling speed
Kenjiro Yazawa

11:00 **2-2-06** Mechanism Elucidation of Silk Dissolution: A Case Point of Hornet Wild Silk
Jerry Muganda Wanyonyi

11:15 **2-2-07** Effects of Radioactive Cesium on Wildsilk Produced by Japanese oak silkmoth, *Antheraea yamamai* --Insects in radioactively contaminated Fukushima forests--
Yusuke Yoshida

11:30 **2-2-08** Establishment and Industrial Application of Recombinant Baculovirus Expression System Using Eri Silkworm Pupae for Large-Scale Protein Production
Kenichi Maegawa

Symposium 15-4

13:30 - 18:00

Realizing the potential of RNA biopesticides: what it takes to make RNAi commercial and durable

Chair: William Moar (Bayer Crop Science), Kenneth Narva (GreenLight Biosciences), Sergey Ivashuta (Bayer)

13:30 **15-4-01** Improving the efficacy of RNA-based insecticides using alternatively structured double-stranded RNAs
Steve Whyard

13:45 **15-4-02** Improvement of RNAi efficiency by knockdown of RNAi-efficiency-related factors in lepidopteran pests
Yoshiaki Tanaka

14:00 **15-4-03** Assessment of the efficiency of virus-like particles (VLPs) for dsRNA delivery to the agricultural pest *Helicoverpa armigera*
Luc Swevers

14:15 **15-4-04** RNA based insecticides - role of carriers towards making it a commercial reality
Neena Mitter

14:30 **15-4-05** The covert-infecting virus HhV in *Euschistus heros* (Hemiptera: Pentatomidae): From discovery to engineering as a VIGS vector
Éricmar Avila dos Santos

14:45 **15-4-06** Protecting crops from lepidopteran insect pests using RNAi
Samanta Bolzan de Campos

15:00 **15-4-07** Efficient production of dsRNA using *Corynebacterium glutamicum* for RNAi-based pesticides
Shuhei Hashiro

15:15 **15-4-08** Low-cost, scalable dsRNA manufacturing through microbial fermentation solves decade-long challenge and unlocks commercial potential of RNAi BioSolutions.
Steven Meyer

15:30 **Coffee Break**

16:15 **15-4-09** Decoding resistance to insecticidal double stranded RNAs in *Leptinotarsa decemlineata*
Swati Mishra

16:30 **15-4-10** Response of *Coccinella septempunctata* to species-specific dsRNAs designed against agricultural pest insects
Eileen Knorr

16:45 **15-4-11** Improving delivery of dsRNA to *Euschistus heros* and off-target effects in *Melipona quadrifasciata*
Daniel Estiven Quiroga Murcia

17:00 **15-4-12** Mammalian Safety of RNA
Matias Attene Ramos

17:15 **15-4-13** Discovery, development, and commercialization of sprayable RNA-based biopesticides
Kenneth Narva

17:30 **15-4-14** Applications of Yeast RNAi Pesticide Technology for Insect Control
Molly Duman Scheel

17:00 **3-4-11** The effects of host size on parasitism by *Trichogrammatoidea cryptophlebiae*.
Emma Jane Stirk

17:15 **3-4-12** Effect of host density on the interspecific competition between egg parasitoids *Trichogramma pretiosum* and *Telenomus remus*
Rabia Ali

17:30 **3-4-13** Enhancing biocontrol efficacy of egg parasitoids through tailored sugars
Margot Wim J Geerinck

17:45 **3-4-14** Root colonization by beneficial soil microbes enhances indirect plant defenses induced by insect egg deposition
Stefano Colazza

18:00 **3-4-15** Frequent intertrophic transmission of *Wolbachia* by parasitism but not predation
Zhichao Yan

Room I

Symposium 3-5

9:45 - 11:45

ad hoc session

Chair: Gregory S Wheeler (USDA-ARS), Ibtissem Ben Fekih (Gembloux Agro-Bio Tech, University of Liège)

9:45 **3-5-01** Effect of the plant-growth promoting rhizobacteria *Bacillus velezensis* and the two hypocrealean fungi of the genus *Metarhizium* on aphid-hoverfly interaction
Ibtissem Ben Fekih

10:00 **3-5-02** Exploring *Psyllaephagus* (Hymenoptera: Encyrtidae) host specificity towards invasive eucalypt psyllids (Hemiptera: Aphalaridae) in South Africa
Privilege Tungamirai Makunde

10:15 **3-5-03** Overlapped host instar preferences by three sympatric parasitoids of *Cheilomenes sexmaculata* (Coleoptera: Coccinellidae)
Chung-Han Cheng

10:30 **3-5-04** Volatile organic compounds of wild strawberry: effect on the behaviour of *Drosophila suzukii* and its natural enemies.
Francesc Gómez Marco

10:45 **3-5-05** Predation activity on sentinel egg masses in adjacent row crop and grassland fields
Hannah Stowe

11:00 **3-5-06** Ladybird-Mediated Indirect Interactions of Banker Plant System on population maintenance and aphid control
Shu Li

11:15 **3-5-07** "Creating beetle multitools", how do we expand the biological control that is provided by arable carabids to include weed regulation
Oskar Rennstam Rubbmark

11:30 **3-5-08** Biological control of the pyrogenic invasive grass cogongrass
Gregory S Wheeler

Symposium 13-3

13:30 - 18:15

Advance in Management of Invasive Mosquitoes in Urban Areas

Chair: Antonios Michaelakis (Benaki Phytopathological Institute), Nikolaos Papadopoulos (University of Thessaly, Greece), George Tsiamis (University of Patras / UP - Department of Environmental Engineering)

13:30 **13-3-01** Oviposition strategies of container breeding mosquitoes: site searching behaviour of gravid *Aedes aegypti*.
Daniel Bray

13:45 **13-3-02** Studies on the gonotrophic cycle of *Aedes aegypti* (Diptera: Culicidae)
Wei-Ting Liu

14:00 **13-3-03** The seasonal thermal ecophysiology and egg metabolome point to different overwintering strategies in two invasive Aedes mosquito species
Ruth Müller

14:15 **13-3-04** Two-Parameter Ovitrap Index for Dengue Vector Surveillance and Management
Wu-Chun Tu

14:30 **13-3-05** *Aedes aegypti* in a warming world: Uncovering sublethal temperature effects on sterility for accurate risk mapping
Amirah Haziqah Binti Rashid

14:45 **13-3-06** Interactions between the thermophilic mosquito species *Culex hortensis* and *Aedes albopictus* - an amplifying effect
Adwine Vanslembrouck

15:00 **13-3-07** Ovariole-specific Yellow-g and Yellow-g2 proteins are required for insect egg chorion rigidity and integrity
Mi Young Noh

15:15 **13-3-08** Differential impact of environmental yeasts on larval development and oviposition behavior of the Asian tiger moqsuito *Aedes albopictus*
Simon Malassigne

15:30 **Coffee Break**

16:15 **13-3-09** Global, asynchronous sweeps at multiple insecticide resistance genes in *Aedes* mosquitoes
Thomas Schmidt

16:30 **13-3-10** Over-expression of cytochrome P450 monooxygenase genes in pyrethroid resistant *Aedes albopictus* population from northern part of West Bengal, India.
Prapti Das

16:45 **13-3-11** Examining the role of lysine-acetylated proteins in the metabolic regulation of *Aedes aegypti* mosquitoes
Patricia Y. Scaraffia

17:00 **13-3-12** Exploiting RNA Interference: An Innovative Approach to Suppress Chikungunya Virus Transmission in Mosquitoes through Oral Administration of dsRNA
Marco Brustolin

17:15 **13-3-13** Mosquito as a potential vector of Lyme disease.
Miriama Peklanska

17:30 **13-3-14** The genetic basis of host preference of two biotypes of the northern House mosquito *Culex pipiens*
Rohan Menon

17:45 **13-3-15** Friend or foe: through vitellogenesis metabolism, a mosquito parasite shows mutualistic traits favoring the fate of the progeny that will be vertically infected.
Maxime Girard

18:00 **13-3-16** Perilous omen: First report of Southeast Asia mosquito, *Aedes famiger* (Wiedemann, 1820) (Diptera: Culicidae) in Jeju Island, Republic of Korea
Woo Jun Bang

Room J

Symposium 13-4

9:45 - 11:45

Biology and management of Container-inhabiting Aedes mosquitoes

Chair: Rui-De Xue (Anastasia Mosquito Control District), Tongyan Zhao (Institute of Microbiology and Epidemiology, AMMS)

9:45 **13-4-01** Exploring the efficacy of In2Care mosquito traps in Aedes aegypti control
Estelle Martin

10:00 **13-4-02** Nutritional stress compromises mosquito fitness and antiviral immunity, while enhancing dengue virus infection susceptibility
Jiayue Yan

10:15 **13-4-03** Population dynamics of *Aedes aegypti* and *Aedes albopictus* and control efforts at St. Augustine, Northeastern Florida
Rui-De Xue

10:30 **13-4-04** Phenotypic and genotypic insecticide resistance against pyrethroids in the Hawaiian *Aedes* mosquitoes
Sangwoo Seok

10:45 **13-4-05** Improving the sterile insect tecnique for *Aedes* mosquito vectors early in the season by using acclimation to make males more cold hardy.
Daniel A Hahn

11:00 **13-4-06** Urban adaptation and association with humans by mosquitoes impact egg thermal and dehydration tolerance
Souvik Chakraborty

11:15 **13-4-07** Stimulatory effects on the reproduction of surviving *Aedes* mosquitoes and transgenerational immature development at deltamethrin-clothianidin posttreatment
Kok-Boon Neoh

11:30 **13-4-08** Container mosquitoes in a California desert
Jennifer A Henke

Symposium 5-4

13:30 - 15:30

ad hoc session

Chair: Shingo Hosoishi (Kyushu University), Michael J. W. Boyle (University of Hong Kong)

13:30 **5-4-01** Intact forest canopies can protect tropical insects from severe climate warming
Michael J. W. Boyle

13:45 **5-4-02** Does fallow field biotopes function as habitats for aquatic insects similar to rice paddy fields and irrigational ponds?
Reiya Watanabe

14:00 **5-4-03** Necrophilous insects: Carrion as a key component for biodiversity processes
Claudia Corina Jordan-Fragstein

14:15 **5-4-04** Evaluating the impacts of the hala scale, *Thysanococcus pandani* Stickney on native hala forest regeneration in the Hawaiian Islands with biological control updates
Mason Russo

14:30 **5-4-05** Mapping leaf-litter beetle communities in lutruwita/Tasmania
Tessa Smith

14:45 **5-4-06** A Century of Unveiling Sri Lanka's Hidden Fauna: A Comprehensive Survey of Leafhopper Biodiversity (1903-2023)
Rajendramani Gnaneswaran

15:00 **5-4-07** Lineage diversification and morphological evolution of the plant-ants *Crematogaster hornetensis*-group in Southeast Asia (Hymenoptera: Formicidae)
Shingo Hosoishi

15:15 **5-4-08** Population assessment and foraging ecology of the rare solitary bee *Megachile cypricola* on the island of Cyprus
Jordan Benrezkallah

Symposium 5-5

16:15 - 18:15

Automated monitoring of insects

Chair: David B Roy (UK Centre for Ecology & Hydrology), Toke Thomas Høye (Aarhus University), Eleanor Slade (Nanyang Technological University)

16:15 **5-5-01** Globally standardised species monitoring with insect camera traps and deep learning models
Toke Thomas Høye

16:30 **5-5-02** Observation of flower-visiting insects in the Bonin Islands using a Raspberry Pi-based video recording system
Kazuya Takeda

16:45 **5-5-03** Presentation Withdrawn

17:00 **5-5-04** Is deep learning effective for monitoring paddy field biodiversity? - Evaluating the learning costs and accuracy
Masayoshi Hiraiwa

17:15 **5-5-05** Insect monitoring using the BioView System: automatic electronic traps aid conventional sampling in remote and natural areas of the Balearic Islands (Spain).
Miguel Ángel Miranda

17:30 **5-5-06** The use of new technologies for automated monitoring of insects: The AMI (Automated Monitoring of Insects) System
Jenna Louise Lawson

17:45 **5-5-07** An audio-synthesis based approach for enhancing automatic detection of cicada songs in challenging chorus conditions
Ryotaro Okamoto

18:00 **5-5-08** From buzzes to bytes: A systematic review of automated bioacoustics models used to detect, classify, and monitor insects
Laura Figueroa

Room K

Symposium 5-6

9:45 - 11:45

Unifying our view of insect biodiversity for conservation

Chair: Michael C. Orr (Staatliches Naturkundemuseum), Akihiro Nakamura (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences)

9:45 **5-6-01** Challenges and opportunities in documenting global insect distribution
Michael C. Orr

10:00 **5-6-02** Phylogenomics illuminates evolutionary history and symbiont coevolution in the ant tribe Camponotini
Bonnie B Blaimer

10:15 **5-6-03** Addressing the taxonomic and capacity impediment in tropical entomology
Eleanor Slade

10:30 **5-6-04** Bee species composition along elevation gradients in tropical montane forest: an implication to pollinator conservation in SEA
Natapot Warrit

10:45 **5-6-05** Evolutionary consequences of climate dynamics on lineage diversification in Mediterranean *Crematogaster* ants
Jody Helena Voges

11:00 **5-6-06** Limited long-term invertebrate data warns of pantropical forest diversity loss resulting from changing climate
Adam Sharp

11:15 **5-6-07** Lepidoptera Iranica, a completed inventory catalogue of the order in Iran used for investigating conservation gaps
Hossein Rajaei

11:30 **5-6-08** Insect ecology and conservation in a changing world: the significance of biodiversity information in the Asian tropics
Akihiro Nakamura

Wednesday 28 August

Main Hall

8:15 - 9:15

Plenary Lecture 3

8:15 **PL3** Edible Insects: Promises and Challenges
Yupa Hanboonsong
Entomology Department, Khon Kaen University (Thailand)

Introducer: Kei Yura (Ochanomizu University / Waseda University)

Women in Entomology (WIE)

14:00 - 15:30

Women in Entomology Lecture (Open to Public)

Women Researchers in Science and Entomology

Chair: Masanobu Itoh

14:00 Opening Remark

14:05 **WIE-OP1** The Time for Women in Science
Charlotte L. R. Payne
Nature Research (UK)

14:30 **WIE-OP2** Bridging the Gap: Women in STEM in France
Gabriela Caballero Vidal
The Sorbonne University (France)

14:45 **WIE-OP3** Women Researchers Paving the Way for Japan's Future
Yoshie Harada
Osaka University (Japan)

15:10 Panel Discussion
Facilitator: Takahiro Shiotsuki
Panellists: Charlotte L. R. Payne, Gabriela Caballero, Yoshie Harada

Citizen Program

16:00 - 17:30

Citizen Program (Open to Public)

Rogue Invaders and Confronting Entomologists: Fighting the Unignorable Threats of Invasive Alien Insects with the Power of Citizen Science

16:00 **CP-OP1** Unravelling the Ecology of Ladybirds through Community (Citizen) Science
Helen E. Roy
UK Centre for Ecology and Hydrology

16:30 **CP-OP2** Gall-inducing Insects: Nature's Architects and Invaders Unraveled
Man-Miao Yang
National Chung Hsing University

17:00 **CP-OP3** The Ants that Conquered the World
Evan P. Economo
Okinawa Institute of Science and Technology

Room A

Award

9:45 - 11:45

The 2024 Awards from the Council of the International Congress of Entomology (CICE)

[Certificates of Distinction (Career Achievement Award)]

9:45 **A-CICE-01** Entomology beats lawn bowling
John H. Borden
Simon Fraser University (Canada)

10:05 **A-CICE-02** Mosquitoes broadly rely on microbes for normal function.
Michael R. Strand
University of Georgia (United States of America)

Room C-1

Symposium 3-6

9:45 - 11:45

Advances on Plant-Derived Food Sources in Biological Control

Chair: Pablo Urbaneja-Bernat (IRTA), Cesar Rodriguez-Saona (Rutgers University), Alejandro Tena (IVIA)

9:45 **3-6-01** Microbe-mediated alterations in floral nectar and consequences for insect parasitoids: a study on species used in biological control
Antonino Cusumano

10:15 **3-6-02** The role of nectar and pollen in protecting plants against pathogens
Felix Wäckers

10:30 **3-6-03** Unveiling the role of plant-derived food sources in enhancing the efficacy of *Dolichogenidea gelechiidivoris* against *Tuta absoluta*
Judit Arnó

10:45 **3-6-04** A predatory mite of coffee agroecosystems benefits from extrafloral nectar of associated trees
Angelo Pallini

11:00 **3-6-05** Honeydew management to promote biological control
Maite Fernández de Bobadilla

11:15 **3-6-06** Exploring the Impact of Plant Guttation on Insect-Plant Interactions in Multiple Cropping Systems
Pablo Urbaneja-Bernat

11:30 **3-6-07** Plant derived foods to support biological control in vineyards
Geoff Gurr

Room C-2

Symposium 20-7

9:45 - 11:45

Behavioural diversity: causes and consequences

Chair: Iago Sanmartin-Villar (Polish Academy of Sciences), Srikrishna Narasimhan (Museum and Institute of Zoology, Polish Academy of Science)

9:45 **20-7-01** Functional benefits of behavioural diversity for group performance
Isaac Planas Sitja

10:15 **20-7-02** Non-additive effects of genetic heterogeneity on foraging-vigilance trade-off in *Drosophila melanogaster*
Takahira Okuyama

10:30 **20-7-03** Are invaders smart? Individual cognition vs social information in invasive and native ants.
Srikrishna Narasimhan

10:45 **20-7-04** Multimodal sensory integration mediates defense behavior during rove beetle interspecies interactions
Jess Kanwal

11:00 **20-7-05** Can metabolism be used to predict dispersal? The insights of Pace-of-life at between individual level.
Violette Chiara

11:15 **20-7-06** Cryptic strategies of *Trachyzulpha formasana* (Orthoptera: Tettigoniidae): background matching and masquerade
Janus Olajuan Boediman

11:30 **20-7-07** Exploring the deterring mechanism by lobed leaf shape against leaf-rolling weevils through the trajectory analysis of inspectional walking
Yumiko Higuchi

Room D

Symposium 16-11

9:45 - 11:45

Bugs in the City: Urban Insect Ecophysiology

Chair: Megan E. Meuti (The Ohio State University), Lydia Fyie (Ohio State University)

9:45 **16-11-01** Particulate matter contamination compromises insect antennal olfactory perception
Wentian Xu

10:00 **16-11-02** Factors influencing abundance and behavior of predators in turfgrass
Shimat Joseph

10:15 **16-11-03** Consequences of adaptation to the urban heat island: testing for eco-evolutionary dynamics in a terrestrial isopod (*Oniscus asellus*)
Ryan Martin

10:30 **16-11-04** Urban Stressors and the Transmission of Pathogens
Michael H Reiskind

10:45 **16-11-05** The effect of urban, rural, and universal pollutants on the life history and gut microbiota of the major malaria vector *Anopheles arabiensis*.
Shune V. Oliver

11:00 **16-11-06** Light pollution interferes with seasonal dormancy in temperate mosquitoes
Lydia Fyie

11:15 **16-11-07** Effects of Artificial Light at Night on the Photoperiodic Response in Flesh Flies
Ayumu Mukai

11:30 **16-11-08** Disentangling the behavioural and physiological consequences of artificial light at night
Theresa Jones

Room E

Symposium 19-1

9:45 - 11:45

The next biomimetics in insect's perspective for the sustainable symbiosis on the globe

Chair: Shuhei Nomura (National Museum of Nature and Science, Tokyo, Japan), Masahiro Ohara (The Hokkaido University Museum)

9:45 **19-1-01** Keynote: The next biomimetics in insect's perspective for the sustainable symbiosis on the globe
Shuhei Nomura

10:00 **19-1-02** Social implementation using the NanoSuit method
Chiyo Senoh

10:15 **19-1-03** The roles of predation and multifunctionality in the macroevolution of ant mandible form and function
Julian Katzke

10:30 **19-1-04** Quantification and classification of butterfly flight patterns based on a visual dictionary and pictures
Yuika Mano

10:45 **19-1-05** Dual effect of vibrations for pest control of fungus gnats and for cultivation of shiitake mushroom
Takuma Takanashi

11:00 **19-1-06** Towards development of pest control using vibrations in the brown-winged green stink bug damaging fruit trees in Japan
Nami Uechi

11:15 **19-1-07** Egg-laying suppression effect of adjuvants in calcium carbonate wettable powder on the peach fruit moth.
Naoko Yoshinaga

11:30 **19-1-08** Functional reconstruction of insect olfactory receptors and their application
Hidefumi Mitsuno

Room F

Citizen Program

Let's Observe Insects with Global Entomologists!

< Event summary >

An indoor observation event will be held at the Kyoto International Conference Center with the aim of increasing children's interest in natural science through exchanges with entomologists from overseas. This event will be co-hosted with the Women in Entomology program of ICE2024 Kyoto. Participants will be divided into small groups with several elementary and junior high school students as well as Japanese graduate students and will observe insects using microscopes while interacting with the children.

Registration has been closed.

10:15 **18-5-03** Introgression dynamics in avian feather lice
Jorge Doña

10:30 **18-5-04** Integrating legacy data and whole genome sequencing on both sides of the tanglegram uncovers unexpected cospeciation in *Degeeriella*
Therese A. Catanach

10:45 **18-5-05** Mitochondrial genome fragmentation in lice: What we know and what we want to know.
Stephen L Cameron

11:00 **18-5-06** Developing tools to connect specimens, traits and phylogenetic trees to understand evolutionary patterns in mammalian lice.
Julie Allen

11:15 **18-5-07** Cophylogenomics of tinamous and their hyper-diverse family of lice (Phthiraptera: Ischnocera)
Kamila Mayumi Kuabara

11:30 **18-5-08** Diversity, Distribution and Population Genomics of Global Human Head Lice through Whole Genome Analysis
Niyomi House

Room B-2

Symposium 18-6

9:45 - 11:45

Biodiversity and taxonomy of lepidopteran insects

Chair: Houshuai Wang (South China Agricultural University Department of Entomology), Toshiya Hirowatari (Kyushu University), Masaya Yago (The University of Tokyo)

9:45 **18-6-01** Evolutionary history of Tineoidea (Insecta: Lepidoptera)
Jadranka Rota

10:00 **18-6-02** Systematics and evolutionary dynamics of insect-fern interactions in the specialized fern-spore feeding Cuprininae (Lepidoptera, Stathmopodidae)
Zong-Yu Shen

10:15 **18-6-03** Macroevolution of butterflies is weakly linked to angiosperms
David Plotkin

10:30 **18-6-04** Systematics, diversification and evolutionary history of butterflies in the tribe Candalidini (Lepidoptera: Lycaenidae)
Michael F. Braby

10:45 **18-6-05** Towards a better understanding of Gelechioid tree of life
Etka Yapar

11:00 **18-6-06** Species-level phylogenomics and historical biogeography of the Apollo butterflies (Papilionidae: Parnassiinae)
Noémie M-C Hévin

11:15 **18-6-07** A new example of unique evolution in oceanic islands: more than 10 undescribed gracillariids in Ogasawara, islands designated as a World Natural Heritage in Japan
Yutaka Tamadera

11:30 **18-6-08** The evolution of diurnality in Uraniidae moths, an unusually colourful and iridescent lineage of Lepidoptera
Leidys Murillo-Ramos

Room I

Symposium 13-5

9:45 - 11:45

CRISPRing vectors: The new era of genome engineering towards vector-borne disease control

Chair: Hitoshi Tsujimoto (Texas A&M University), Bianca Burini (University of Florida)

9:45 **13-5-01** Sand Fly Microinjection for CRISPR Mutation
Robert Harrell

10:15 **13-5-02** Exploring adaptation of CRISPR interference (CRISPRi) in the mosquito, *Aedes aegypti*
Hitoshi Tsujimoto

10:30 **13-5-03** Probing and Perturbing the piRNA Pathway with Targeted Mosquito Genome Modifications
Vanessa Michelle Macias

10:45 **13-5-04** Genetic analysis of oviposition behavior for mosquito surveillance and control
Matthew DeGennaro

11:00 **13-5-05** Gene-drived Ectoexpression of *AalNix3S4* in Dengue vector, *Aedes albopictus*
Xiaoguang Chen

11:15 **13-5-06** Harnessing DNA repair to revert to a non-transgenic state, or how to plan for the end-of-life of your favorite transgene when it is no longer needed
Zach N Adelman

11:30 **13-5-07** From Genome to Phenome: Tools to understand the basic biology of ticks
Monika Gulia-Nuss

Room J

Symposium 13-6 — 9:45 - 11:45

Neglected vectors and pests in a changing climate

Chair: Bethany McGregor (United States Department of Agriculture), Amy Hudson (United States Department of Agriculture, Agricultural Research Service), Phillip Shults (United States Department of Agriculture)

9:45 **13-6-01** The changing eco-epidemiology of tick-borne spotted fever group rickettsioses: paired vector-clinical-environmental studies in the Americas
Melissa Nolan

10:00 **13-6-02** The changing landscape of *Culicoides*-borne viruses in Europe.
Marion England

10:15 **13-6-03** Exploring Biting Midge Species Distributions Under Diverse Climate Models
Phillip Shults

10:30 **13-6-04** Effects of climate on larval *Culicoides* sp. abundance in the Central Great Plains of the US and implications for the transmission of a livestock disease
Bethany McGregor

10:45 **13-6-05** Distinguishing the role of two vector genera in a disease system
Amy Hudson

11:00 **13-6-06** Black flies aggressivity in Kafolo: influence of climatic and environmental factors
Touré Donatié Serge

11:15 **13-6-07** DNA barcoding-assisted morphological identification of sand flies and their association with environmental factors in Taiwan
Yu-Feng Tsai

11:30 **13-6-08** Superfly - The unintended consequences of pesticide resistance on the thermal tolerances of house flies (*Musca domestica*)
Travis W Rusch

Room K

Symposium 5-7 — 9:45 - 11:45

Urban Arthropods

Chair: Olivia Sanllorente (University of Granada)

9:45 **5-7-01** Citizens' perception of insects and its relationship with the extinction of experience
Olivia Sanllorente

10:00 **5-7-02** Exploring *Psocathropos lachlani* Ribaga, the Most Synanthropic Household Insects in Taiwan: Unveiling the Ecological Insights Through Citizen Science and Climatic Analysis
Mei-Ling Chan

10:15 **5-7-03** Urbanization and community garden features affect the taxonomic diversity and functional traits of wild bees
Astrid E. Neumann

10:30 **5-7-04** Distribution of Aculeate wasps in a subtropical urbanized biodiversity hotspot: assessing multi-scale drivers under climate change scenarios
Ji Hyeon Park

10:45 **5-7-05** Urban green spaces and adjacent areas of Mexico City as a refuge for resilient species: case study for Auchenorrhyncha fauna (Insecta, Hemiptera)
Olivia Esperanza Aponte-Mejia

11:00 **5-7-06** Investigating the effect of mowing as a habitat restoration practice on the stem-dwelling insect community of *Solidago altissima* in urban meadowscapes
Thomas CK Hall

11:15 **5-7-07** Unveiling the Calling Diversity of Cricket Across Urban Parks Through Soundscape Techniques
Chia-Chien Hung

11:30 **5-7-08** The effects of artificial noise on the acoustic behavior of *Ormebius infuscatus* (Orthoptera: Mogoplistidae)
Sheng-Hung Lin

Thursday 29 August

Main Hall

8:15 - 9:15

Plenary Lecture 4

8:15 **PL4** Understanding the Population and Behavioral Ecology of an Invasive Forest Insect: Insights for Sustainable Pest Management
Juan C. Corley
Grupo de Ecología de Poblaciones de Insectos, Instituto de Investigaciones Forestales y Agropecuarias (INTA Bariloche-CONICET) & Departamento de Ecología, Universidad Nacional del Comahue (Argentina)

Introducer: Mayumi Yoshimura (Forestry and Forest Products Research Institute)

RoomA

Symposium 14-12

9:45 - 11:45

Bringing it home: Advances in research on the international pest Popillia japonica

Chair: Francesco Paoli (Council for Agricultural Research and Economics (CREA)), David W Held (Auburn University), Leonardo Marianelli (CREA -Council for Agricultural Research and Economics)

9:45 **14-12-01** Global invasion pathways of the Japanese beetle *Popillia japonica* revealed by genomic data
Antonio Carapelli

10:00 **14-12-02** Effectiveness of *Attract-and-kill* devices against the adults of *Popillia japonica* (Coleoptera: Scarabaeidae)
Francesco Paoli

10:15 **14-12-03** Sprayable dsRNA formulations for management of *Popillia japonica* Newman
David W Held

10:30 **14-12-04** Prevention of *Popillia japonica* larval transport in nursery plants
Jason Bradley Oliver

10:45 **14-12-05** *Popillia japonica* Italian outbreak management by means of natural strains of Biological Control Agents
Leonardo Marianelli

11:00 **14-12-06** Biological control of *Popillia japonica*
Karla M Addesso

11:15 **14-12-07** Building a surveillance strategy for the Japanese beetle in Europe: accounting for likelihood of entry and establishment to achieve early detection
Leyli Borner

11:30 **14-12-08** Use of Detection Canines for Invasive Pests: The Japanese Beetle
Melissa Singletary

Symposium 14-13

13:30 - 18:15

Multi-disciplinary innovation for stored-product insect pest management

Chair: Deanna Scheff (United States Department of Agriculture), Alison Gerken (USDA Agricultural Research Service)

13:30 **14-13-01** Stored-product entomology in Canada: Moving forward through innovation with a foot firmly planted in the past.
Brent G Elliott

13:45 **14-13-02** Searching ability and parasitism efficacy of *Habrobracon hebetor* in storage rooms
Jordi Riudavets

14:00 **14-13-03** Evaluation of diatomaceous earth formulation against stored product insects in semi-field conditions
Philippos M Ioannidis

14:15 **14-13-04** Ozonation Strategies for Pest Control: Enhancing Phytosanitary Inspection Against the Invasive Box Tree Moth
Darija Lemic

14:30 **14-13-05** Novel behaviorally-based tactics to combat phosphine resistance among stored product insects at food facilities
William R. Morrison

14:45 **14-13-06** Monitoring of *Lobesia botrana* (Lepidoptera: Tortricidae) with semiochemicals and Ultra Violet Light Emitting Diodes (UV-LED) under mating disruption
Eduardo Fuentes-Contreras

15:00 **14-13-07** Development of an insect-free qPCR-based test for the detection of pest insects in stored grain
Nuria Agusti

15:15 **14-13-08** Current and future potential distribution of a biocontrol beetle, *Teretrius nigrescens*, and the overlap with its prey, *Prostephanus truncatus*
Rachel R. Harman

15:30 **Coffee Break**

16:15 **14-13-09** Discrimination methods for Japanese species of the genus *Morophagoides* (Lepidoptera, Tineidae)
Yohei Osada

16:30 **14-13-10** A New SmartProbe Technology for Early Detection of Insect Pests and Environmental Monitoring in Stored Products
Zhongli Pan

16:45 **14-13-11** Advances in stored product insect pest identification using artificial intelligence
Alison Gerken

17:00 **14-13-12** Enhancing cigarette beetle trapping: novel insights and applications of terpenoids as co-attractants
Salvatore Guarino

17:15 **14-13-13** Efficacy of extreme temperatures for the control of all life stages of *Oryzaephilus surinamensis* (L.), *Plodia interpunctella* (Hübner) and *Ephestia kuehniella* Zeller
Maria K. Sakka

17:30 **14-13-14** The effects of sub-lethal temperatures on feeding behavior of *Tineola bisselliella* (Hummel): IPM implications for conditioning spaces to reduce damage
James C Feston

17:45 **14-13-15** Efficacy and economics of refrigerated fumigation treatments for stored grain insects
Brodie Foster

18:00 **14-13-16** Utilization of stored-product insects as feed and food through circular economy practices
Christos Athanassiou

Annex Hall1

Symposium 14-14

9:45 - 11:45

Control Strategies of Hemipteran Pest Bugs

Chair: Ken Tabuchi (Tohoku Agricultural Research Center, NARO), Un Taek Lim (Andong National University)

9:45 **14-14-01** Use of a mass trapping system and sulphur applications to manage *Halyomorpha halys* in fruit orchards
Davide Scaccini

10:00 **14-14-02** Characterization and improvement of "Cimiciato" damage management: Insights from trials on the impact of *Halyomorpha halys* on hazelnut quality
Flavia De Benedetta

10:15 **14-14-03** Parasitism of the fruit-piercing stink bug, *Glaucias subpunctatus*, by the tachinid fly, *Cylindromyia petiolata*
Ayaka Tsunashima

10:30 **14-14-04** Dynamics of the box bug *Gonocerus acuteangulatus* and impact of egg parasitoids in Italian hazelnuts
Roberto Rizzo

10:45 **14-14-05** The search for the egg parasitoid wasps of the rice stink bugs by settling frozen egg masses in the paddy fields
Ayumu Sumita

11:00 **14-14-06** Seasonal occurrence pattern of egg parasitoids and its biological attributes, and parasitism on eggs of *Riptortus pedestris* (Fab.) (Hemiptera: Alydidae)
Md. Abdul Alim

11:15 **14-14-07** Microbial control of *Riptortus pedestris* (Hemiptera: Alydidae) using an entomopathgenic fungus *Beauveria bassiana*
Un Taek Lim

11:30 **14-14-08** Prediction of crop damage by hemipteran pests using land use data: the spatially explicit model for mapping hazard, and its extrapolation
Ken Tabuchi

Symposium 14-15

13:30 - 18:15

Novel approaches in the management of invasive fruit flies (Diptera: Tephritidae)

Chair: Nikolaos Papadopoulos (University of Thessaly, Greece), Marc F Schetelig (Justus-Liebig-University Giessen, Winchester Str. 2, 35394 Giessen, Germany), George Tsiamis (University of Patras | UP - Department of Environmental Engineering)

13:30 **14-15-01** The REACT's Innovative Approach to *Bactrocera* Sexing Systems for Sterile Insect Technique programs
Marc F Schetelig

14:00 **14-15-02** A metabolomics approach for improved mass-rearing
Francesca Scolari

14:15 **14-15-03** Transcriptomic markers for Quality Control of sterile males in *Ceratitis capitata* SIT applications
Kostas Mathiopoulos

14:30 **14-15-04** Precision guided Sterile Insect Technique in Mexican fly *Anastrepha ludens*
Georgia Gouvi

Room G

Symposium 11-6

9:45 - 11:45

Insects at the Helm: Driving Food Security, livelihoods, and Environmental Sustainability in Agri-Food Systems

Chair: Chrysantus Tanga (International Centre of Insect Physiology and Ecology (ICIPE))

9:45 **11-6-01** Growth performance and protein content of desert locust, *Schistocerca gregaria* raised on locally available plants for prospective domestication by small scale farmers.
Linnet Gohole

10:15 **11-6-02** Vitamin E: An assistant for black soldier fly to reduce cadmium accumulation and toxicity
Zhihui Shi

10:30 **11-6-03** Heterologous expression of phytases in an insect host for use in agriculture feed
Carly Carter

10:45 **11-6-04** Evaluating Impact of Dietary Inclusion of Yellow Mealworm (*Tenebrio molitor*) on Cultured Fish.
Atsushi Ido

11:00 **11-6-05** Black Soldier Fly Frass as Biofertilizer and Biostimulant for melon and lettuce
Marco Gebiola

11:15 **11-6-06** Exposing Ohio Students To Insect Based Foods: Preferences And Future Implications
James R Jasinski

11:30 **11-6-07** The metabolomic fingerprint of an edible insect species, *Prionoplus reticularis* (Coleoptera: Cerambycidae), along a latitudinal gradient.
Neil Birrell

Symposium 15-5

13:30 - 18:15

Molecular determinants driving pesticide resistance and selectivity in invertebrates

Chair: Ralf Nauen (Bayer AG, Crop Science Division), Gaelle Le Goff (INRAE), Thomas Van Leeuwen (Ghent University)

13:30 **15-5-01** Dominant versus recessive resistance: contrasting risks of chemical insecticides and Bt toxins
David G Heckel

13:45 **15-5-02** Low dose insecticide impacts on insects - Implications for pest control
Philip Batterham

14:00 **15-5-03** Understanding the evolution and function of xenobiotic detoxification enzymes in a global crop pest
Bartlomiej Troczka

14:15 **15-5-04** Genome Editing with CRISPR/Cas9 to Understand Molecular Mechanisms of Insecticide Resistance
Dylan Brown

14:30 **15-5-05** The development of a cost-efficient eQTL scanning strategy to unravel the broad transcriptional response of a generalist pest to novel hosts
Femke De Graeve

14:45 **15-5-06** Molecular insights into mechanisms mediating coumaphos tolerance in honeybees
Xingzhi Xiao

15:00 **15-5-07** Resistance incidence and mechanisms in *Frankliniella occidentalis* populations from Türkiye
Umut Toprak

15:15 **15-5-08** Monitoring resistance of *Spodoptera frugiperda* populations from Thailand
Marlen Saladini di Rovetino

15:30 **Coffee Break**

16:15 **15-5-09** Insect cytochrome P450s in pesticide resistance and selectivity
René Feyereisen

16:30 **15-5-10** Transcriptional regulation of detoxification gene expression in the two-spotted spider mite *Tetranychus urticae*
Dries Amezian

16:45 **15-5-11** Expansion of CYP9A subfamily P450s empowers spodopteran insects with diverse genetic options for evolving insecticide resistance
Yidong Wu

17:00 **15-5-12** Molecular bases of pyrethroid action, resistance and selectivity
Ke Dong

17:15 **15-5-13** New examples of resistance to bacterial insecticidal proteins always seems to surprise us: Western Corn Rootworm and Mpp75Aa1.1 and Vip4Da2
William Moar

17:30 **15-5-14** Binding affinities to "receptors" explain Cry protein toxicity
Haruka Endo

17:45 **15-5-15** Molecular Determinants in ABC Transporters Mediating Bt Cry1 Selectivity and Resistance
Roksaneh Sayadi Boroujeni

11:00 **3-9-06** Assessment of pathogenicity and sublethal effects of entomopathogenic fungi on *Aedes aegypti* and *Anopheles stephensi* mosquitoes via oral infection
Sikandar Hussain

11:15 **3-9-07** Screening of *vip2* and *vip3* gene in Thai *Bacillus thuringiensis* strains and their insecticidal activity towards *Phenacoccus manihoti* MAT-FERR and *Spodoptera frugiperda*
Prakai Rajchanuwong

11:30 **3-9-08** Transinfection with bacteria, enhancing classical biological control of grain crop aphids?
Safieh Soleimannejad

Symposium 13-7

13:30 - 18:15

Epidemiology of Japanese Encephalitis in a changing climate

Chair: Lee Cohnstaedt (USDA-ARS-NBAF), Chad Mire (United States Department of Agriculture), Natalia Cernicchiaro (Kansas State University)

13:30 **13-7-01** Reassessing the risk of Japanese encephalitis introduction to and transmission in the United States.
Natalia Cernicchiaro

13:45 **13-7-02** Competency of North American culex mosquito to Japanese encephalitis virus, genotype II
Dana Mitzel

14:00 **13-7-03** Japanese encephalitis virus dynamics in Asia: genotypes, vectors, and putative amplifying hosts
Astri Nur Faizah

14:15 **13-7-04** New mosquito vector surveillance and management tools for mosquito-borne disease outbreaks
Lee Cohnstaedt

14:45 **13-7-05** Species comparison of host-seeking behaviors and suppression in Culicidae mosquitos using behavioral tracking and machine-learning classification
Takuya Uehara

15:00 **13-7-06** Using mosquito sounds and machine learning to identify invasive mosquito species of medical importance
Julie Augustin

15:15 **13-7-07** Land use alters mosquito communities along altitudinal gradients in Taiwan
Jhen Liu

15:30 **Coffee Break**

16:15 **13-7-08** Effect of mating and blood meals on the demographic characteristics of *Culex pipiens f. pipiens* and of *Culex pipiens f. molestus*
Georgios Mastronikolos

16:30 **13-7-09** Infrared spectroscopy as a tool for monitoring biological age in mosquitoes.
Mauro Pazmino

16:45 **13-7-10** Life stage-dependent responses of medically relevant mosquitoes to heat waves
Isabelle Kramer

17:00 **13-7-11** An Integrated Vector Management Program for the Prevention and Control of *Aedes aegypti* in Puerto Rico
Julieanne Miranda

17:15 **13-7-12** Insecticide Resistance Testing Before a Public Health Emergency, I Rarely Spray so I Don't Need to Test, Right?
Janet McAllister

17:30 **13-7-13** LAMP detection of virus-derived DNA from vector mosquitoes for xenomonitoring
Hiroka Aonuma

17:45 **13-7-14** The Gulf South Vector Education Centers for Training, Outreach, and Resources: A regional partnership to strengthen the prevention and management of vector-borne diseases.
Claudia Riegel

18:00 **13-7-15** The Influence of ABO Human Blood Group on the Feeding Rate Preferences of *Aedes* and *Anopheles* Mosquitoes (Diptera: Culicidae)
Watthanasak Lertlumnaphakul

Room J

Symposium 13-8

9:45 - 11:45

Entomological approaches to tackle vector-borne zoonotic diseases

Chair: Chizu Sanjoba (The University of Tokyo), Yasuyuki Goto (The University of Tokyo)

9:45 **13-8-01** Diseases transmitted by sand flies
Seray Toz

10:00 **13-8-02** Habitat preferences of sand flies
Yusuf Ozbel

10:15 **13-8-03** Determination of sand fly fauna in the foci of canine leishmaniasis in Zambia
Tatsuki Sugi

10:30 **13-8-04** Behavior of *Leishmania*-infected sand flies reveals hidden biology critical to interruption of leishmaniasis transmission.
Shaden Kamhawi

10:45 **13-8-05** Vector Control for Tackling Vector-Borne Zoonotic Diseases in Zambia
Enala Tembo Mwase

11:00 **13-8-06** Trypanosome infection rates, host preference, and genetic structure of tsetse flies in the African trypanosomiasis endemic foci in Zambia and Malawi
Kyoko Hayashida

11:15 **13-8-07** Evidence-based tsetse control to reduce sleeping sickness transmission at the human-wildlife interface
Karina Mondragon-Shem

11:30 **13-8-08** Mapping the world of *Culex* mosquito feeding: insights from a meta-analysis
Jet Sofie Griep

Symposium 20-8

13:30 - 18:15

Diversity Beyond Insects: Global Gathering of Entomologists with Shared Knowledge across Disciplines

Chair: Nannan Liu (Auburn University), Le Kang (Institute of Zoology, Chinese Academy of Sciences)

13:30 **20-8-01** A neural circuit tuning the olfactory conflicted cues in locust aggregation
Le Kang

14:00 **20-8-02** Coordination of immune responses by extracellular serine protease systems in multiple insects
Haobo Jiang

14:15 **20-8-03** CRISPR-Cas9 genome editing uncovers the mode of action of methoprene in the yellow fever mosquito, *Aedes aegypti*
Guan-Heng Zhu

14:30 **20-8-04** Architectures and potential roles of glutathione transferases on chemical adaptation of insect pollinators
Fang Zhu

14:45 **20-8-05** Both JA- and ABA-mediated signaling pathways regulate the ovicidal defense of rice against a phloem-feeding herbivore
Qing Gao

15:00 **20-8-06** Revolutionary botanical repellent discoveries and their applications in agricultural, medical and urban pest management
Junwei Jerry Zhu

15:15 **20-8-07** Fine tuning of behavioral plasticity by long noncoding RNAs in locusts
Bing Chen

15:30 **Coffee Break**

16:15 **20-8-08** Harnessing "Little Mighty" cockroaches: pest management and beneficial utilization
Sheng Li

16:30 **20-8-09** G-protein-coupled Receptor Mediated Signaling Pathways in in Cytochrome P450-mediated insecticide resistance
Nannan Liu

16:45 **20-8-10** Mechanisms of resistance to *Bacillus thuringiensis* Cry proteins in a generalist insect *Trichoplusia ni*
Ping Wang

17:00 **20-8-11** CRISPR and transgenic-based precision-guided sterile insect technique for *Aedes aegypti* population suppression
Ming Li

17:15 **20-8-12** Identification of novel transcriptional regulators to facilitate insect survival under hypoxia
Keyan Zhu-Salzman

17:30 **20-8-13** Engineering a complex, multiple enzymes-mediated synthesis of natural plant pigments in the silkworm, *Bombyx mori*
Kai Chen

17:45 **20-8-14** Molecular mechanisms of the systemic invasion of rice stripe virus in insect vectors
Feng Cui

18:00 **20-8-15** Expression Pattern of Olfactory Receptors in the Larval Mosquito
Feng Liu

Friday 30 August

Main Hall

8:15 - 9:15

Plenary Lecture 5

8:15 **PL5** Scaling Up Integrated Surveillance to Combat Arbovirus Transmission and Emergence, A Perspective from Kenya
Rosemary Sang
AAS/ICIPE (Kenya)

Introducer: Kyoko Sawabe (National Institute of Infectious Diseases)

ICE2024 Kyoto Special Movie

16:15 - 16:30

Ingenuity on the earth

Insects staring through a filming always amaze us. What do they see? What are they thinking? What drives them? Although we cannot stand in the same perspective as the insects, we have recorded them just as they are. Japan's only public broadcaster, NHK's popular natural history program "Darwin's Amazing Animals' has, with the huge help of many entomologists, selected the best footages around the world from archives over almost 20 years. We dedicate this special movie to all entomologists and all insects.

16:30 - 17:30

Plenary Lecture 6

16:30 **PL6** Learning from Insect Intelligence - From a Nature-Centered Perspective -
Ryohei Kanzaki
Research Center for Advanced Science and Technology, The University of Tokyo (Japan)

Introducer: Sakiko Shiga (Osaka University)

Closing Ceremony

17:30 - 18:00

RoomA

Symposium 14-17

9:45 - 15:30

Fruit fly management technologies

Chair: Pattara Opadith (Kyoto University), Stefano De Faveri (Queensland Department of Agriculture and Fisheries), Atsushi Honma (Okinawa Pref. Pl. Prot. Cent./Ryukyu Sankei)

9:45 **14-17-01** Population structure of the Japanese orange fly, *Bactrocera tsuneonis* (Diptera: Tephritidae)
Pattara Opadith

10:15 **14-17-02** Comparative genome yields insights into host diversity and differentiation in a wide variety of Tephritidae flies
Shaokun Guo

10:30 **14-17-03** Establishment of CRISPR/Cas9 system and its application in Y specific gene for *Bactrocera dorsalis* population management
Jiao Qiao

10:45 **14-17-04** Exploring the function and structure of Tephritid Y chromosomes to develop new control methods.
Dimitris Rallis

11:00 **14-17-05** Killing two bugs with one stone: reproductive interference between two fruit fly pests and its potential application for SIT
Atsushi Honma

11:15 **14-17-06** The interspecific mating tests among three Tephritid flies (Diptera: Tephritidae) pests in the laboratory and the assessment of pest management
Chuan-Jie Hong

14:30 **14-19-05** Mechanisms of optical manipulation on natural enemies using UV or near-UV LED light
Young-Gyun Park

14:45 **14-19-06** In the presence of red light, the host plants lose their attractability to the melon thrips
Mika Murata

15:00 **14-19-07** Advanced insect nets: Red-colored nets effectively control micro pest
Susumu Tokumaru

15:15 **14-19-08** Attract, confuse, repel: Basics of visual perception and possibilities of optical manipulation of insect pests
Niklas Stukenberg

Annex Hall2

Symposium 14-20

9:45 - 11:45

ad hoc session

Chair: Mar Vilanova (Instituto de Ciencias de la Vid y del Vino - ICW), Wen - Po Chuang (National Taiwan University)

9:45 **14-20-01** Thrips and virus management in Taiwan: impact of transmission mode
Yi-Ju Chen

10:00 **14-20-02** Unraveling the impact of entomopathogenic nematodes application in aerial pest control in grape quality: assessment of must volatile compounds
Mar Vilanova

10:15 **14-20-03** Are physically acting bioinsecticides practically and economically compatible with open-field agriculture?
Aimee Jane Tonks

10:30 **14-20-04** EARLY DETECTION AND CONTROL MEASURES OF RED PALM WEEVIL IN MALAYSIA
Azlina Zakaria

10:45 **14-20-05** Pyramiding *BPH* genes in rice maintains resistance against the brown planthopper under climate change
Wen-Po Chuang

11:00 **14-20-06** A New Feature of the Laboratory Model Plant *Nicotiana benthamiana*: Dead-End Trap for Sustainable Field Pest Control
Wenhao Han

11:15 **14-20-07** Compositional optimization of miticidal activity, ecotoxicity, and phytotoxicity in rosemary essential oils for controlling *Tetranychus urticae*
Junho Yoon

11:30 **14-20-08** Unraveling the role of Herbivore-Induced Plant Volatiles (HIPVs) in citrus plant defenses: mitigating the impact of citrus pests through volatile exposure
Raul Ortells Fabra

Symposium 14-21

13:30 - 15:30

A New Era of Pest Management, New Approaches from Innovative Methods

Chair: Kyoko Sawabe (National Institute of Infectious diseases), Tomoyuki Hashimoto (Japan Environmental Sanitation Center)

13:30 **14-21-01** Comparisons of dominant species of rodents and their resistance factors to anticoagulant rodenticides between Japan, the United States and Europe.
Satoru Nagaoka

13:45 **14-21-02** Insect pest control using new generation sex pheromones and technologies
Maria Konstantopoulou

14:00 **14-21-03** The difference of required pest control concerning about foreign substances between Japan and other contries
Kohjiro Tanaka

14:15 **14-21-04** Detecting Cereal Leaf Beetle (*Oulema* sp.) Damage on Winter Wheat: A Fusion of Proximal Remote Sensing and Advanced Machine Learning
Sandra Skendžić

14:30 **14-21-05** Real-Time Monitoring of Flying Insects in Industrial Food Facilities
Kakurou Kanno

14:45 **14-21-06** Innovative Approaches to Varroa Mite Management in Australia
Fazila Yousuf

15:00 **14-21-07** Biology and management of nuisance caddisflies (Trichoptera) in the Uji River, Kyoto, Japan
Goro Kimura

15:15 **14-21-08** Advancing mosquito repellent research: innovations in non-biting efficacy testing and formulation analysis on skin-applied repellents
Mingeun Son

Room I

Symposium 3-10

9:45 - 11:45

Development of new technologies for biological control and IPM in greenhouses.

Chair: Junichiro Abe (NARO), Eizi Yano (Agri-Sokan Inc.), Alberto Urbaneja (Instituto Valenciano de Investigaciones Agrarias (IVIA))

9:45 **3-10-01** Advancing from zoophytophagous predator-induced plant defenses to innovative inter-plant communication-based control method
Meritxell Perez-Hedo

10:15 **3-10-02** Companion plants for enhanced pest control in tomato crops
Alberto Urbaneja

10:30 **3-10-03** Development of *N. tenuis* banker plant system augmented with IPM techniques to regulate whitefly densities on tomato plants under greenhouse conditions in Japan.
Junichiro Abe

10:45 **3-10-04** Development of practical banker plant systems for aphid control in Japan.
Koukichi Nagasaka

11:00 **3-10-05** Violet light complements biological control tools in enhancing *Nesidiocoris tenuis* predation potential on whiteflies in protected systems; an integrative approach to whitefly control
David Wari

11:15 **3-10-06** Toward the optimization of alternative plant diversity for managing *Nesidiocoris tenuis* in cold tomato greenhouses
Antonio Gugliuzzo

11:30 **3-10-07** How to select the most suitable omnivorous predator for biological control in protected crops
Luciana Tavella

Symposium 3-11

13:30 - 15:30

The viability of entomopathogenic nematodes and their symbionts-derived by-products as biological control agents

Chair: Ayako Kusakabe (University of Arizona), Raquel Campos-Herrera (ICVV-CSIC)

13:30 **3-11-01** Boosting Agents to Enhance Biocontrol Efficacy of Entomopathogenic Nematodes
David Shapiro-Ilan

14:00 **3-11-02** The potential of entomopathogenic nematodes and their symbiont derived products for pest control in orchards and in horticulture
Apostolos Kapranas

14:15 **3-11-03** Entomopathogenic nematodes and their symbiotic bacteria by-products to manage *Lobesia botrana* (Lepidoptera: Tortricidae) in vineyards
Raquel Campos-Herrera

14:30 **3-11-04** Nematicidal efficacy of insect-killing *Photorhabdus* by-products for control of plant parasites
Ayako Kusakabe

14:45 **3-11-05** Enhanced entomopathogenic potency of *Steinernema monticolum* KHA701 through augmented symbiotic bacterial diversity.
Taiki Sugiyama

15:00 **3-11-06** Chemical cues from entomopathogenic nematodes influence plant-insect interactions and enhance biological control
Anjel Helms

15:15 **3-11-07** Viability of entomopathogenic nematodes in insect pest management: a chemical ecology perspective
Ivan Hiltpold

Room J

Symposium 13-9

9:45 - 11:45

Confronting the threat of arbovirus infections and their vectors

Chair: Kyoko Sawabe (National Institute of Infectious diseases), Chizu Sanjoba (The University of Tokyo)

9:45 **13-9-01** Understanding the Dynamics of Dengue Fever Outbreaks: An Analysis of Travel History, Vector Density, and Transmission in Tainan City, Taiwan.
Ting-Chun Shih

10:00 **13-9-02** Vector and host diversity shape West Nile virus transmission in urban green spaces along an urban-rural transect
Christopher M. Stone

10:15 **13-9-03** Overwintering of Japanese encephalitis virus and its vector mosquito *Culex tritaeniorhynchus* Giles in Japan
Ryusei Kuwata

10:30 **13-9-04** Potential for expanding exposure risks to *Ixodes spp.* and their associated pathogens in Japan based on spatial modeling approaches
Patrick Kelly

10:45 **13-9-05** Tick-borne viruses in Asia as a threat to emerging human infectious diseases
Daisuke Kobayashi

11:00 **13-9-06** Blowflies are the potential vector for transmission of the HPAI virus
Ryosuke Fujita

11:15 **13-9-07** Impact of biting midges as vectors of livestock diseases
Tohru Yanase

11:30 **13-9-08** Electropenetrography: A new tool to study probing and ingestion behaviors of biting midges
Anastasia Cooper

Symposium 13-10

13:30 - 15:30

Mosquito Biology and Genetic Biocontrol

Chair: Omar Akbari (UCSD), Yoosook Lee (University of Florida), John M. Marshall (University of California, Berkeley)

13:30 **13-10-01** Uncovering Dengue Virus Host Factors: Paving the Way for Innovative Antiviral Strategies
Shin-Hong Shiao

13:45 **13-10-02** The taste of humans, nectar, and egg-laying sites: gustation in the Asian tiger mosquito
Lisa S. Baik

14:00 **13-10-03** Fibrinopeptide A from host blood induces blood-feeding arrest in *Aedes aegypti*
Chisako Sakuma

14:15 **13-10-04** The regulation of the amino acid metabolism after a blood meal in *Aedes aegypti*
Yusuke Kato

14:30 **13-10-05** Temporal Population Dynamics of *Aedes albopictus* (Diptera: Culicidae) in Campus: A Case Study in Taiwan
Yi'En Leong

14:45 **13-10-06** The role of reactive oxygen species (ROS) in maintaining epithelial cells in mosquito midgut after blood-feeding
Emi Maekawa

15:00 **13-10-07** Polyandry in the wild: High rates of female remating in natural populations of *Aedes* mosquitos has implications for vector control in a dengue-endemic urban city.
Tyrone Tan

15:15 **13-10-08** Effect of temperature on *Wolbachia* during *Culex quinquefasciatus* embryo development
Jovany Barajas

Room K

Symposium 5-8

9:45 - 11:45

The unknowns of the causes, consequences, and patterns of insect decline

Chair: Eliza Grames (Binghamton University)

9:45 **5-8-01** Prevalence of Allee effects in terrestrial arthropods: a meta-analysis
Manuela Branco Simões

10:00 **5-8-02** Savanna dung beetle dynamics: trophic networks and impacts of herbivore loss
Finote Gijsman

10:15 **5-8-03** Impacts of artificial light at night on moth community structure in Hong Kong
Victoria Elizabeth Amaral

10:30 **5-8-04** Tropical Biodiversity Redistribution and Paradigm Shift in Conservation
Cheng-Hao Lin

10:45 **5-8-05** Effects of farming management at the landscape scale on pollinators and natural enemies and associated crop pests. A review.
Ronan Marrec

11:00 **5-8-06** Biodiversity monitoring in tropical dry forests: assessing local perturbation effects on hyperdiverse leafminer insect communities using DNA metabarcodes and barcodes
Antonio Hernandez Lopez

11:15 **5-8-07** Considering the risk of pesticide exposure across an already stressed populations
Chris Halsch

11:30 **5-8-08** Drivers of insect biodiversity loss: a unified, multidimensional conceptual network
Eliza Grames