Book of abstracts

1st Meeting of the Red CIBA and ISAE South West Europe Region

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Primeras Jornadas de la Red CIBA y de la Región Sudoeste Europeo de la ISAE

ONE WELFARE - SETTING ANIMAL WELFARE SCIENCE INTO CONTEXT

Animal Welfare Science studies the welfare of animals through an evidence-based approach. Welfare scientists use welfare indicators, assess the impact that different practices have on animals and carefully and methodically analyze behavioral and physiological data to monitor and assess the wellbeing of animals.

The concept of One Welfare recognises the interconnections between animal welfare, human wellbeing and the environment. Whilst animal welfare scientists focus mainly on the welfare of animals (among other areas). A One Welfare approach encourages reporting and exploring the connection and added value that each individual welfare science area may bring to the others. A One Welfare approach encourages the integration of the direct and indirect links between animal welfare, human wellbeing and environmentally friendly animal keeping systems. The One Welfare concept enables the means to consider joined up improvements to animal welfare, human and environmental wellbeing worldwide as a basis for expanding opportunities within a number of disciplines related to animal welfare science across all of its facets, including sustainability, farming, livelihoods support or abuse and neglect.

The One Welfare Framework is made up of five sections which can help to promote key global objectives such as supporting food security, reducing human suffering (e.g., abuse and neglect of vulnerable people) or increasing resilience and security for communities in developing countries. It complements and extends the approach of the One Health theme used for human and animal health.

By adopting a 'One Welfare' approach we can help put animal welfare science into context and enrich the results of research projects and programs, facilitating implementation of animal welfare science in a more holistic manner. Animal Welfare Scientist can contribute to help identifying case studies and best practice which provide added value to society and contributors across animal welfare, human wellbeing and/or the environment

REBECA GARCIA PINILLOS

Director and Founder at One Welfare CIC

Final programme

July 14th (Day 1) Thursday	
13:00-15:00	Registration, Poster set-up
15:00-15:30	Open ceremony
15:30-16:00	Poster session 1
16:00-19:00 (17:00-17:30)	**Workshop** Workshop 1 - ***Open Science*** by Anna Olson (University of Porto, Portugal) and Emma Fàbrega (IRTA, Spain) Workshop 2 - ***Using the STRANGE framework to improve animal welfare*** by Christian Rutz (University of St Andrews, UK) and Matteo Chincarini (University of Teramo, Italy) (Coffee break)
19:30-23:00	**Social activity** Casual cocktail dinner with soft music performance at the outdoor area of Torre Vila Puig (walking distance from the Faculty of Veterinary Medicine, within UAB campus). Timetable: 19:30-20:30 Welcome drink 20:30-21:30 Cocktail dinner 21:30-23:00 Open bar Sponsored by Loro Parque Fundación

July 15th (Day 2) Friday	
09:00-9:45 (Streaming)	Keynote talk 1 - ***One Welfare - Setting Animal Welfare Science into context*** by Rebeca García Pinillos (Director and Founder of One Welfare, UK) Sponsored by Jean Monnet Chair in European Policies
09:45-11:30 (Streaming)	**Oral presentation session 1: *Indicators to assess animal welfare*** 09:45-09:57 *Methods for assessing welfare in kenneled dogs: a critical evaluation* - Ana Catarina Gonçalves Vieira de Castro 09:57-10:10 *Individual behavioural causes of tail biting in pre-finishing piglets* - Marc Bagaria 10:10-10:22 *Can dietary carob pulp positively modify the behavioural pattern in fattening pigs?* - Diego Nicolas Bottegal 10:22-10:34 *Effect of number of feedings on behaviour in holstein calves* - Patricia Carulla Pascual 10:34-10:46 *Do horses referred for mild lameness show any facial expression of pain and behavioural issue at rest?* - Maria Giorgia Riva 10:46-10:58 *Crustaceans welfare* - Ariadna Montemar Martinez 10:58-11:10 *Changes in body temperature of calves during the first week of life are influenced by temperature-humidity Index* - Daniela Alberghina 11:10-11:22 *Minimally and non-invasive monitoring of glucocorticoid hormones in domestic and wild animals* - Annaïs Carbajal
11:30-12:00	Poster session 2 Coffee break
12:00-12:45 (Streaming)	Keynote talk 2 - ***From emotion to affective state of animals. Is there a theoretical framework for studying animal mental health?*** by Elodie Chaillou (INRAE, France)

12:45-13:00 (Streaming)	**Oral presentations session 2: *Improving human-animal relationship and the environment*** 12:45-12:57 *Welfare considerations in animal assisted interventions the role of the practitioner* - Antonia Eraud 12:57-12:10 *Elderly caregivers and dogs: bond and welfare* - Jesica Raimonda 12:10-12:22 *The effect of environmental enrichment on the behaviour of suckling calves* - Eva Mainau 12:22-12:34 *One zoo, six senses: the future of design* - María Figuerola Deltoro 12:34-12:46 *Evaluation of the environmental enrichment of primate enclosures in spanish zoos a decade after the introduction of the european union directive 1999/22/EC* - Federico Guillén Salazar 12:46-12:58 *Wild boar synurbization is detrimental to wild boar health and welfare* - Gregorio Mentaberre
13:00-15:00	Lunch (Eating with Ethologists)
15:00-16:15 (Streaming)	**Oral presentations session 3: *New approaches and technologies for improving animal welfare*** 15:00-15:12 *Methodology of the combination of geolocation collars and bluetooth ear tags on extensive reared livestock to validate cow/calf relation in extensive farms in Spain* - Roger Vidal Cardos 15:12-15:22 *Chaid decision trees: a tool to identify the most critical animal welfare indicators in broiler farms* - Xavier Averós 15:22-15:34 *Assessment of the health, housing, and feeding welfare domains in dairy cows, by labeling the normal ranges of PLF traits – experience from clearfarm pilot studies* - Yaneth Gómez Herrera 15:34-15:46 *Advancing cattle behavior and welfare through precision agriculture with a global positioning system-accelerometer device* - Marta Elena Alonso de la Varga 15:46-15:58 *How animal welfare research in zoological institutions can contribute to species conservation* - Oriol Talló Parra 15:58-16:10 *Assessing mammal trapping standards in wild boar drop-net capture* - Gregorio Mentaberre
16:15-17:00 (Streaming)	Red CIBA and ISAE SWE assemblies
17:00-17:30	Closing ceremony

Organizing Committee members:

- Alberghina, Daniela; Università degli Studi di Messina (Italy)
- Alonso de la Varga, Marta; Universidad de León (Spain)
- Averós, Xavier; Neiker (Spain)
- Blanco Penedo, Isabel; Universitat de Lleida (Spain) and Swedish University of Agricultural Sciences (Sweden)
- Bottegal, Diego; Universitat de Lleida (Spain) and Instituto Nacional de Tecnología Agropecuaria (INTA) (Argentina)
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- Heng-Lun Ko, Universitat Autònoma de Barcelona (Spain)
- Liste, Guiomar; ESIC University (Spain)
- Llonch, Pol; Universitat Autònoma de Barcelona (Spain)
- Talló Parra, Oriol; Universitat Autònoma de Barcelona (Spain)
- Villagrá, Arantxa; Instituto Valenciano de Investigaciones Agrarias (Spain)

Programa definitivo

Jueves 14 de Julio (Día 1)	
13:00-15:00	Registro y colocación de pósters
15:00-15:30	Ceremonia de apertura
15:30-16:00	Sesión de pósters 1
16:00-19:00 17:00-17:30	**Talleres** Taller 1 - ***Open Science*** impartido por Anna Olson (Universidad de Oporto, Portugal) y Emma Fàbrega (IRTA, España) Taller 2 - ***Using the STRANGE framework to improve animal welfare*** impartido por Christian Rutz (Universidad de St Andrews, Reino Unido) y Matteo Chincarini (Universidad de Teramo, Italia) (Pausa café)
19:30-23:00	**Actividad social** Cena de cortesía (típico tapeo más bebidas) con banda de música en vivo, en un entorno distendido al aire libre en Torre Vila Puig (a sólo 15 minutos andando desde la Facultad de Medicina Veterinaria, dentro del campus UAB). Horario 19:30-20:30: Aperitivo de bienvenida 20:30-21:30: Cena de cortesía (“Tapeo”) 21:30-23:00: Barra libre Evento patrocinado por Loro Parque Fundación

Viernes 15 de Julio (Día 2)	
09:00-9:45 (transmisión online)	Ponencia invitada 1 - ***One Welfare - Setting Animal Welfare Science into context*****,** impartida por Rebeca García Pinillos (Directora y Fundadora de One Welfare, Reino Unido) Patrocinado por Cátedra Jean Monnet en Políticas Europeas

09:45-11:30 (transmisión online)	**Presentaciones orales. Sesión 1: *Indicadores para evaluar el bienestar animal*** 09:45-09:57 *Methods for assessing welfare in kenneled dogs: a critical evaluation* - Ana Catarina Gonçalves Vieira de Castro 09:57-10:10 *Individual behavioural causes of tail biting in pre-finishing piglets* - Marc Bagaria 10:10-10:22 *Can dietary carob pulp positively modify the behavioural pattern in fattening pigs?* - Diego Nicolas Bottegal 10:22-10:34 *Effect of number of feedings on behaviour in holstein calves* - Patricia Carulla Pascual 10:34-10:46 *Do horses referred for mild lameness show any facial expression of pain and behavioural issue at rest?* - Maria Giorgia Riva 10:46-10:58 *Crustaceans welfare* - Ariadna Montemar Martinez 10:58-11:10 *Changes in body temperature of calves during the first week of life are influenced by temperature-humidity Index* - Daniela Alberghina 11:10-11:22 *Minimally and non-invasive monitoring of glucocorticoid hormones in domestic and wild animals* - Annaïs Carbajal
11:30-12:00	Sesión de pósters 2 Pausa café
12:00-12:45 (transmisión online)	Ponencia invitada 2 - ***From emotion to affective state of animals. Is there a theoretical framework for studying animal mental health?*** impartida por Elodie Chaillou (INRAE, Francia)
12:45-14:00 (transmisión online)	**Presentaciones orales. Sesión 2: *Mejorando la relación humano animal y el ambiente animal*** 12:45-12:57 *Welfare considerations in animal assisted interventions the role of the practitioner* - Antonia Eraud 12:57-12:10 *Elderly caregivers and dogs: bond and welfare* - Jesica Raimonda 12:10-12:22 *The effect of environmental enrichment on the behaviour of suckling calves* - Eva Mainau 12:22-12:34 *One zoo, six senses: the future of design* - María Figuerola Deltoro 12:34-12:46 *Evaluation of the environmental enrichment of primate enclosures in spanish zoos a decade after the introduction of the european union directive 1999/22/EC* - Federico Guillén Salazar 12:46-12:58 *Wild boar synurbization is detrimental to wild boar health and welfare* - Gregorio Mentaberre
13:00-15:00	Comida (Almorzando con Etólogos)
15:00-16:10 (transmisión online)	**Presentaciones orales. Sesión 3: *Nuevos enfoques y tecnologías para mejorar el bienestar animal*** 15:00-15:12 *Methodology of the combination of geolocation collars and bluetooth ear tags on extensive reared livestock to validate cow/calf relation in extensive farms in Spain* - Roger Vidal Cardos 15:12-15:22 *Chaid decision trees: a tool to identify the most critical animal welfare indicators in broiler farms* - Xavier Averós

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16:15-17:00 (transmisión online)	Asamblea de la Red CIBA y de ISAE SWE
17:00-17:30	Ceremonia de clausura

Miembros del Comité Organizador:

- Alberghina, Daniela; Università degli Studi di Messina (Italy)
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- Averós, Xavier; Neiker (Spain)
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9:57-10:10	INDIVIDUAL BEHAVIOURAL CAUSES OF TAIL BITING IN PRE-FINISHING PIGLETS - *Marc Bagaria*
10:10 - 10:22	CAN DIETARY CAROB PULP POSITIVELY MODIFY THE BEHAVIOURAL PATTERN IN FATTENING PIGS? - *Diego Nicolas Bottegal*
10:22 - 10:34	EFFECT OF NUMBER OF FEEDINGS ON BEHAVIOUR IN HOLSTEIN CALVES - *Patricia Carulla Pascual*
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12:22 - 12:34	ONE ZOO, SIX SENSES: THE FUTURE OF DESIGN - *María Figuerola Deltoro*
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Time	**Presentation's title and presenting author**
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15:58 - 16:10	ASSESSING MAMMAL TRAPPING STANDARDS IN WILD BOAR DROP-NET CAPTURE - *Gregorio Mentaberre*

Oral session 1: Indicators to assess animal welfare

METHODS FOR ASSESSING WELFARE IN KENNELED DOGS: A CRITICAL EVALUATION

Vieira de Castro, Ana Catarina[1*]; Guedes, Margarida[2]; Guilherme-Fernandes, Joana[2]; Casaca, Miriam[1]; Pereira, Ana Margarida[2]; Fonseca, António J.M[2]; Olsson, I Anna[1]; Cabrita, Ana Rita J[2]

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Rescue shelters and kennels are a reality for thousands of dogs around the world. Conditions of confinement, especially over long periods of time, may have a severe impact on dog welfare. There is increasing interest by the scientific community to provide tools to easily and reliably assess the welfare of dogs living in confined environments. Several methodologies have been developed to this end. In a series of studies with laboratory beagles (n=12), we used different behavioral, physiological and cognitive approaches to assess the impact of environmental enrichment activities on welfare. In Study 1, we assessed the impact of leash walks on dog welfare through behavior in the home pen and salivary cortisol concentration. We found higher cortisol concentrations on the days dogs were taken for leash walks as compared to days without walks ($z=2.00$; $p=0.04$), but no differences on behavioral parameters emerged. In Study 2, we evaluated the impact of *nosework* activities on dog welfare through cognitive measures. Preliminary data shows that a 12-day protocol of *nosework* activities (Study 2.1) had no effect on dogs' 'optimism' in the cognitive bias task ($t=-1,778$, $p=0.075$), as measured by the latency to approach an ambiguous bowl after the dogs have learned a spatial discrimination between a bowl containing food and a bowl containing no food. More positive affective states are associated with lower latencies to approach the ambiguous bowl in this task. In Study 2.2 (data under analysis), we increased the duration of the *nosework* protocol to 21 days, and welfare was measured again using the cognitive bias task and the unexpected reward loss test. In the latter, dogs had to solve a puzzle toy to obtain high value food rewards, which, on a second phase, were then switched to low value rewards. Dogs in more positive affective states should be less sensitive to reward loss. Building on these results in combination with literature, we will present the state of the art and to critically evaluate and discuss welfare assessment methodologies for kenneled dogs. The often small populations, in combination with the need to assess welfare repeatedly over prolonged periods of time, raise particular challenges for welfare measurement, in particular with existing methods to evaluate affective states. Further avenues of research into the development of accurate measures for dog welfare and the best practices around them will also be addressed.

INDIVIDUAL BEHAVIOURAL CAUSES OF TAIL BITING IN PRE-FINISHING PIGLETS

Bagaria, Marc[1,2*]; Kuiper, Laura[2]; Meijer, Ellen[3]; Sterck, Elisabeth HM[2,4]

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Tail biting (TB) is a widespread problem in pig production systems, and has a negative impact on both animal welfare and farm income. Tail docking is a commonly used practice to reduce the problems that TB provokes, although it does not solve its underlying causes and it decreases the welfare of the animals. This explorative study aims to understand the causes of TB behaviour at the individual level and identify whether these are related to a particular type of tail biting: two-stage, sudden-forceful, or obsessive. This research was conducted in a standard commercial setting, observing 89 tail-docked piglets divided into 8 groups in their pre-finishing phase, from 5 to 8 weeks of age. Daily observations were performed during four weeks, each individual was observed for a total of 160 min using continuous focal sampling. Ten individual behaviours (tail chewing, tail handling, tail exploration, ear exploration, environmental and pen exploration, lying, sitting, standing, nosing, and aggression) were recorded. Based on general behaviour expected to be linked to giving TB (PCA1), receiving (PCA2), and TB damage (PCA3), different PCA were comprised and related to TB given, TB received, and TB damage. In our study, TB did not lead to major damage on the piglets' tail at 8 weeks of age. TB was observed 229 times, and most of the individuals (71%) were categorized as both tail biters and victims. When relating PCA1 (3 PCs; 57,9% variance) with TB given, piglets that gave more TB showed more "active exploration" behaviour. When relating PCA2 (3PCs; 57,8% variance) with TB received, piglets receiving more TB were more "explored and restless" and "aggressively explored". When relating PCA2 with TB damage, piglets presenting more tail lesions showed more "non-social fighting" behaviour. When relating PCA3 (4 PCs; 68,5% variance) with TB damage, these were not significantly related. These results indicated that the pre-damage stage of two-stage TB was the predominant TB type. Sudden-forceful TB was seen on a few occasions, but only caused minor tail lesions. Obsessive TB was not observed. Two-stage TB may be remedied by providing suitable manipulatable objects or substrate, and sudden-forceful tail biting by minimizing competition between piglets. This study shows that studying TB at individual level helps to identify which type of TB is present. This identifies the causes of TB and suggests the appropriate measures that farmers could apply to prevent the development of TB behaviour in piglets.

CAN DIETARY CAROB PULP POSITIVELY MODIFY THE BEHAVIOURAL PATTERN IN FATTENING PIGS?

Bottegal, Diego[1*]; Casado, Blanca[1]; Bernaus, Laia[1]; Lobón, Sandra[2]; Latorre, María Ángeles[3]; Argemí Armengol, Immaculada[1]; Álvarez Rodríguez, Javier[1]

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This study aimed to assess if the inclusion of dietary carob pulp (Cp, a potential antioxidant and fiber-enriched feedstuff) and high doses of vitamin E can affect the repertoire of behaviours and welfare in fattening pigs. A total of 220 crossbred pigs of both sexes (entire males and females) of 130 days of age and 78.4 kg BW were housed in 44 pens (5 pigs/pen and 0.94m^2/pig) into two similar barns at BonÁrea Group experimental farm. During 39 days, the animals were fed *ad libitum* with one of 4 iso-energetic and iso-protein diets or treatments in a 2 x 2 factorial design with 2 Cp levels (0 *vs.* 20%) and vit E (30 *vs.* 300 IU/kg). The days 9,16, 30 and 36 of the study, instantaneous scan sampling was performed on 8 pens/treatment every 10 min during three 1.5 h-length sessions (early morning, mid, morning, and mid-day) to record behavioural activity budget patterns. Eleven behaviours were measured: drinking, eating, lateral and ventral lying, dog sitting, standing, explorative activity, locomotion, positive social activity, and negative social activity (sum of fighting and mounting behaviour). Behavioural data (% of animals performing an activity in each scan sampling) were transformed to arc sine and analysed by a linear mixed model (diet, session, sex and barn as fixed effects and day and pen as random effect). No interactions nor Vitamin E effects were found on pigs' activity, so they were not considered into the model. The animals which received a Cp diet showed less ($p<0.05$) standing (2.14 *vs.* 2.86%) and drinking activity (0.85 *vs.* 1.23%), but more eating behaviour (8.35 *vs.* 7.24%) compared with control animals. Session effect was found ($p<0.0001$) on lateral and ventral lying, eating, drinking, exploring and locomotion. Pigs presented more ventral lying posture and eating behaviour during early morning. In the mid-morning more drinking and lateral lying were found, which represents reduced physical activity and reflects enhanced satiety. Finally, animals again increased ($p<0.0001$) the activity (eating, exploring and locomotion) and tended ($p<0.07$) to have more positive social activities in the mid-day. Female pigs spent more time drinking (1.27 *vs.* 0.82%), exploring (12.60 *vs.* 10.85%) and standing (3.71 *vs.* 1.50%) than entire males, which showed more negative social behaviours (0.80 *vs.* 0.20%). Although Cp-fed pigs partially modified their behavioural pattern, our hypothesis that higher fiber content of Cp might increase satiety and hence decrease pig frustration (i.e.; dog sitting) or negative social activity could not be confirmed.

EFFECT OF NUMBER OF FEEDINGS ON BEHAVIOUR IN HOLSTEIN CALVES

Carulla, Patricia[1*]; Ramón Moragues, Adrián[2]; Pérez, Alejandro[3]; Sebastián, Francisco[3]; Astiz, Susana[4]; Estellés, Fernando[1]; Villagrá, Arantxa[2]

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Animal welfare indicators can be grouped into three fundamental spheres: biological functioning and health, affective states or cognitive judgment and natural living. Only the health sphere has been studied for a long time, but studies have recently promoted positive experiences and emotional states from affective states or cognitive judgment and natural living spheres. Calves are very susceptible to stress during their early stages of life, so it is necessary to ensure maximal animal welfare and health during this period. Feed management during this stage has a great impact on animal welfare. In nature, calves suckle their mothers more than 6 times a day, but in production systems, they usually are milk-fed twice a day. Thus, the objective of this study was to compare the effect of feeding milk with different frequencies per day on calves' behaviour. A total of 168 animals housed at the commercial farm Cowvet (Titaguas, Spain), between 1 and 37 days of age (17±9 days), were studied from September 30, 2020, to February 11, 2022. Calves were classified into two treatments according to the feeding program: group 2T, in which animals received 6 litres of milk replacer by bottle distributed in two feedings of 3 litres each (n=84) and group 3T in which animals received 6 litres of milk replacer by bottle in three feedings of 2 litres each (n=84). Calves were housed individually for 7±2 days after arrival and in pairs until weaning at 54±2 days of life. The following behaviours were assessed: aggression, drinking, walking, sucking element (referring to sucking some part of the facilities), eating, defecation, exploring, grooming, inactive, playing, suckling, empty suckling bottle, urination, rumination, self-grooming and social. Behavioural observations were performed by scan sampling every 5 minutes during 2 hours at 0, 2, 6, and 24 hours after the animals were housed in pairs and once per week until weaning. Behavioural data was analysed using frequency tables with the goodness-of-fit test. Results showed significant differences ($P<0.05$) in sucking element, eating, grooming, suckling, empty suckling bottle and rumination between 2T and 3T. The 2T animals showed a higher frequency of non-nutritive oral activities (sucking element and empty suckling bottle) and feeding behaviour (eating and rumination). Finally, 3T animals presented a higher frequency of grooming behaviour. In conclusion, feeding calves three times per day could have a beneficial effect on animal welfare, as it improves positive behaviours such as grooming and reduces hunger-related ones.

DO HORSES REFERRED FOR MILD LAMENESS SHOW ANY FACIAL EXPRESSION OF PAIN AND BEHAVIOURAL ISSUES AT REST?

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In horses, timing of diagnosis and treatment of orthopaedic disorders importantly affect their prognosis. Behavioural modifications are initial signs of a painful condition and can possibly help the veterinarian in making an early diagnosis and address the clinical suspect. This study aimed to investigate whether horses referred for mild lameness showed, at rest, any modifications in behaviour or facial expression that can help recognising a painful condition. Two groups of sport horses balanced for age, sex and training activity were included in a case-control study: mild lameness group (N=10) horses referred for lameness considered as “mild” because not seen in every stride (AAEP lameness scale: score 1 or 2), and control group (N=15) clinically sound horses. Owners were asked to fill out a questionnaire about behaviour shown by horses during exercise and daily management. Specifically, they were asked on a 4-point scale to report the frequency (from never to always) their horse was reluctant to move or showed signs of discomfort on specific type of soil or gait, signs of aggression or fear when groomed or saddled. For each horse, 1 min video was recorded when the animal was at rest in their box and later assessed by a group-blind observer using the Horse Grimace Scale (HGS), a facial-expression–based pain coding system including six Facial Action Units (scored from 0 to 2). The observers attended a specific training period until they reached an excellent level of inter-observer agreement. Mann-Whitney test was used to assess differences between groups. 50% of mildly lame horses were reported to be “sometimes” fearful (e.g., avoid) and aggressive (e.g., bite or kick) towards people, significantly more compared to the control group (CI 0.03-0.35; P=0.036); they were also reluctant to be saddled, avoiding or reacting in an aggressive way (always=10%; often=10%; sometimes=50%) (CI 0.12-0.73; P=0.005). The HGS score was significantly higher for mild lame horses (3.1+/-1.8) compared to control ones (1.2+/-1.2) (CI 1.18-2.65; P=0.015). These results suggest that systematically assess changes in behaviour and facial expressions can be helpful to get an early warning of mild orthopaedic disorders. Including a HGS assessment after diagnostic block is suggested for further validation of the results.

CRUSTACEANS WELFARE

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There is increasing concern about animal welfare and more discussion between scientists about whether decapod crustaceans can suffer. In 2005, the European Food Safety Authority (EFSA) stated that decapod crustaceans should receive protection. However, no regulation exists in the European Community yet, evidencing the urgency to implement a legal framework to protect crustacean decapods. The evidence attributing sentience-pain-suffering to crustaceans is weak since the structural organization and operational capacity of the central nervous system (CNS) is small and simple, physiological indices might be related to stress, and behavioral changes could be simple reflexes to harmful stimulus. Regarding the CNS, we have shown that the Norway lobster, *Nephrops norvegicus,* has ganglion fusions in the CNS, such as subesophageal ganglion and glia cell envelopes. Some neuropils are highly developed in the brain, indicating strong mechano- and chemoreceptor sensory capacities. Hence, there is evidence that the CNS is highly developed and organized, suggesting the possibility to experience pain. Although, some authors have stated a positive correlation between the brain's size and the nervous system's sensitivity influencing the capacity for pain experience, the bee's complex cognitive abilities with such a tiny brain, somehow contradicts the previous statement. Regarding the behavioral level, there is evidence that decapod crustaceans probably can suffer because when challenged by a negative stimulus, they show complex behavioral responses, such as escaping from the stimulus noxious, attaching the abdomen against the shell after evacuation, as well as rubbing or grooming. Importantly, the exposure to noxious stimulus can be learnt if it is repeated and decapods may anticipate to avoid the negative stimulus. At a physiological level, crustaceans receiving a harmful stimulus, their lactate levels increase, a parameter that is usually induced by stress in more developed species. At the same time, a response was observed when electrical stunning was done to the primary nerves that transmit information to and from the brain, i.e., the circumesophageal connectors. Pain perception can be estimated using a multifactorial scale with 17 criteria and crustaceans fulfill the 14 of these criteria. Although nociception in crustaceans has not been scientifically proven, their welfare should be considered according to the precautionary principle. Therefore, the food industry should be committed to anticipate new regulations and the demand from consumers and improve animal welfare, being electrical slaughter, an initial step applied by some industries. Summarizing, we review the critical points of crustacean welfare for research purposes, and fishery and aquaculture production.

CHANGES IN BODY TEMPERATURE OF CALVES DURING THE FIRST WEEK OF LIFE ARE INFLUENCED BY TEMPERATURE-HUMIDITY INDEX

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The temperature humidity index (THI) combines temperature and humidity into a single value. THI has been widely used to predict the effects of environmental warmth in farm animals. THI dynamics over the Mediterranean basin for the period (1970-2050), shows that this area should be expected to undergo the highest THI for the period 2041-2050 with thermal stress for farm animals during the summer. Extensive measurements of calf body temperature (BT) during the first week of age are limited in the literature. The study was undertaken to evaluate the influence of THI on BT of calves during the first week of age. BT is important for farm personnel and veterinarians to assess calf health. BT of six Holstein clinically healthy calves, born in June at an extensive and commercial production farm located in Villa Trinidad (Santa Fe, Argentina), were measured every 4 hours during the first week of age (from 24 h to 7th day). At birth calves were fed with maternal colostrum. At 24 h of life they were separated from their mothers, but they had visual and tactile contact with their neighbours, and they received 2 l of whole milk twice daily at 06:00 am and 04:00 pm. Temperature and relative humidity were recorded, and THI calculated. During the studied period THI were on average 56.86 with minimum of 32 and maximum of 76. Rectal temperature was taken using a digital thermometer, the mean values were 38.53±0.58°C with a minimum of 37.15 and a maximum of 39.85. BT varied in a distinct diurnal pattern with values being lowest at 8.00 and highest at 16.00. Pearson's correlation coefficients were computed to evaluate the relationship between THI and BT during the experimental period. A significant positive correlation has been found between THI and mean BT measured every time point ($r=0.7$, $P<0.001$). Calves should be closely monitored when THI reaches 65 to 69 to minimize the risk of heat stress–related impairments. BT regulation in neonatal calves is immature, the correlation found could suggest that THI associated with thermal discomfort and heat stress can alter BT and affect calf health by metabolic and physiological changes related to BT.

MINIMALLY AND NON-INVASIVE MONITORING OF GLUCOCORTICOID HORMONES IN DOMESTIC AND WILD ANIMALS

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Measurement of glucocorticoid hormones is commonly used as an indicator of animal response to stress. Assessments of these hormones, in turn, combined with other measurements, can provide insights into the animal physiology. Although blood has been the gold standard wherein hormone levels are quantified, its sampling can trigger a stress response by itself that may confuse the interpretation of results. Consequently, the use of minimally or non-invasive media for endocrine studies is gaining attraction since its collection involves minimum or non-animal contact. In mammals, the most popular alternative media include saliva, feces and hair. In birds, excreta and feathers are commonly used. The skin mucus, the surrounding water, whole-body homogenates and the scales are nowadays very popular in fish stress-related studies. In reptiles and amphibians, although hormone measurements are not as common as the above-mentioned animal groups, glucocorticoids have also been assessed in excreta, dermal secretion, and different epidermal tissues. The kind of hormonal information these samples provide will rely on the way they accumulate hormones while they are forming or growing (or even while the tissue is fully grown). For example, the analysis of saliva, will provide a snapshot of the hormonal profile at a single time point, whereas hair (a tissue that accumulates hormones while it is growing), will offer a long-term and retrospective measure of the endocrine status. This presentation aims to briefly introduce the use of minimally or non-invasive samples as biomarkers of stress physiology in domestic and wild animals and highlight important methodological issues that need to be addressed before hormone quantification. Information regarding how these samples integrate the effects of the stress response at different time-scale and how to successfully apply these techniques for each specific purpose will be exposed. It will also summarize benefits and pitfalls of their application in field and laboratory conditions, which include concerns related to sample collection, storage and transport. Glucocorticoid hormones are extracted using different alcohol-based techniques. Choosing the right extraction procedure is of utmost importance since hormones present in each sample type can vary in composition and concentration. After extraction, it is imperative to demonstrate that the analytical method used is reliable in measuring the target hormones. We will also discuss the above-mentioned factors involved in the hormone quantification which must be considered to ensure good quality of the results.

Oral session 2: Improving human-animal relationship and the environment

WELFARE CONSIDERATIONS IN ANIMAL ASSISTED INTERVENTIONS: THE ROLE OF THE PRACTITIONER

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Animal Assisted Interventions (AAI) have been shown to offer numerous benefits for people in need of mental and physical enrichment. These interventions are facing growing popularity. However, studies about the animals' perspective involved in AAI are lacking. Considering that AAI generally focus on the needs of humans, the question of this research is: what must be done by practitioners to ensure animal welfare in the context of AAI while supporting human health? The study is focused on dogs, dolphins and horses participating to AAI. A review of the current literature has enabled to identify issues and potential solutions. A qualitative study of 34 practitioners in AAI, across France, Spain, the United Kingdom and the United States has allowed to understand the challenges of those professionals. The literature review shows that AAI represents many threats to animals, affecting all of the Welfare Quality® principles (good housing, good feeding, good health, appropriate behaviour). The chronological order of our review from 2000 to 2019 reveals that those issues remain existing with time. In our qualitative study, 98% of the practitioners (n=34) consider animal welfare very important. Eighty-one percent believe that AAI could benefit humans and animals. However, 11% mention benefits only according to human needs, denying animals' needs. Education of practitioners is considered as the top solution to improve animal welfare (44%). Participants who are the least inclined to find animal welfare easy to ensure are the participants who are trained in AAI (78%), probably because education makes them aware of the challenges of animal welfare. Participants who are the most inclined to find animal welfare easy to ensure are the ones who are not trained (88%). However, only 65% of the practitioners have been trained. Ownership of the venue and/or the animals seems to have a positive impact on animal welfare since owners are the second category of participants at finding animal welfare easy to ensure (84%), probably because they have more resources and/or control on the animals. However, only 26% of the practitioners own the venue/or the animals. Practitioners in AAI present a good will to ensure animal welfare but for now, they are lacking of knowledge and resources. We recommend the establishment of a legal framework, compulsory training and close collaborations between practitioners and veterinarians. If action is taken, this investigation highlights how AAI have potential to become a One Welfare framework, ensuring mutual benefits for both humans and animals.

ELDERLY CAREGIVERS AND DOGS: BOND AND WELFARE

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A better understanding of human animal bonds (HAB) can include the study of specific characteristics of dogs and their owners. This research was conducted with the aim of exploring the bond between elderly caregiver (aged 60 or more) and their dog and their association with psychological and immunological variables in humans and behavioral variables in canines. Fifty-three persons answered a Life Satisfaction Scale (LSS), Spanish version of the Monash Dog Owner Relationship Scale (MDORS), session 4 and 6 from Canine Behavioral Assessment & Research Questionnaire (C-BARQ) and some questions related to evaluate the importance of the bond during the COVID-19 Pandemic. Their dogs had to do The Kong Test and a Cognitive Bias Test. Finally, variation of salivary IgA (sIgA) was assessed in people in two instances in relation to HAB. Saliva samples were collected in plastic tubes, kept cold (2 to 8 °C) and sent to the laboratory to measure sIgA levels. Results demonstrate that dogs are supportive to elderly people and were great company during the lockdown: interesting answers, scores in the questionnaires and evident increase in sIgA was found in both intervention instances. These increases were not associated with the quality of the bond, nor with the caregiver´s life satisfaction. Two groups were differentiated in the MDORS. Twenty-three participants belonged to low MDORS group and 30 to high MDORS group. Also, outstandingly female scored lower on C-BARQ 4, meaning males engage in more separation-related behaviors; older dogs got lower scores on C-BARQ 6, so young dogs display more attachment behaviors and 30 people stated their dogs show fear and anxiety behaviors. Mongrels` owners had a lower perceived cost in their dogs in MDORS C. Association was found between C-BARQ 4 and MDORS C. Eighty-three percent of respondents had a positive perception during lockdown, who were higher in MDORS Total and in MDORS E, while their dogs scored higher in C-BARQ 4. Further, fearful or anxious canines tend to be more pessimistic, dogs with a negative cognitive bias responded less frequently to their caregivers` call and performed worse during Kong test. In conclusion, dogs can generate positive experiences in elderly people`s life and sIgA can be a useful biomarker to demonstrate it. Even so, it is necessary to further evaluate how the behavior of dogs can affect the bond and how some behaviors can show a lack of well-being.

THE EFFECT OF ENVIRONMENTAL ENRICHMENT ON THE BEHAVIOUR OF SUCKLING CALVES

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Environmental enrichment is a well-known methodology to improve animal welfare, as it helps the animals reduce frustration and boredom and express natural behaviours. However, studies using environmental enrichment in suckling calves in commercial conditions are scarce. The objective was to determine the effect of environmental enrichment on the welfare and behaviour of suckling calves towards humans before weaning. Six lactation pens with 15 – 16 calves of 3 weeks old, were randomly assigned either to be enriched pens (Enrch; pens with two brushes attached to the walls, and three hanging toys; n=3), or control pens (Ctrl; with no environmental enrichment; n=3). The calves stayed in the lactation pens until 9 weeks of age when they were weaned and allocated to growth pens. Statistical analyses were performed with a Glimmix model (SAS, version 9.4) and results are given as mean ± SD. From week 4 to 9, posture (standing, lying), position in the pen (central, peripheral), and activity (ruminating, cross-sucking, agonistic and cohesive behaviours, exploration of the pen facilities, exploration of the environmental enrichment and play behaviour) were weekly observed during 2 minutes per pen from 9:30 to 13:00 through scan sampling. In weeks 5, 7, and 9, 5-min voluntary human approach tests were performed in each pen. The number of calves that got close to the observer (≤1.5m) or touched the observer were counted. The time until the first contact (touching) between a calf and the observer in the pen (latency to touch the observer) was also recorded. Enrch calves spent 4.28% ± 8.76 of time manipulating the enrichment material. Calves' posture neither playing behaviour were not affected by treatment (P=0.08 and P=0.3918, respectively). A higher percentage of Enrch calves were ruminating relative to Ctrl calves (24.3% ± 12.62 in Ctrl vs. 27.4% ± 12.26 in Enrch; P=0.0017), being rumination more frequent from week 8 onwards. Enrch calves showed a lower number of explorations to the pen facilities (P=<0.0001), cross-sucking (P=0.0001), and agonistic events (P=0.0025) than Ctrl calves. A higher percentage of Enrch calves tended to approach the observer (49.9% ± 6.76 in Ctrl vs. 63.8% ± 13.33 in Enrch, P=0.007). However, the latency to touch the observer did not differ between treatment groups (80.2 sec ± 55.71 in Ctrl vs. 49.0 sec ± 53.18 in Enrch; P=0.2239). Therefore, environmental enrichment in suckling calves enhances ruminating, reduces negative behaviours such as cross-sucking and agonistic events and seems to promote human-animal relationship.

ONE ZOO, SIX SENSES: THE FUTURE OF DESIGN

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Throughout centuries, human beings have had a close relationship with wild animals in captivity as a status of economic, political and territorial power. The diversity of animal space-design is the result of its adaptation to the social needs and concerns of the time. Until a few decades, the designs were anthropocentric, placing humans and their requirements above those animals, but this perspective is increasingly changing towards a more ecological and biophilic one. There are already examples of this type of conscious and ethical designs that, through the animals and visitors' perception of the environment, seek to provide decision-making capacity, complexity and control over the domain. This study will review the parallel evolution of zoo design, animal welfare and society, presenting a new approach that integrates these variables. In this way, these exchange spaces between people and animals which are the zoological centers and sanctuaries, are experienced by both sides through the five senses, giving a real sense to this relationship. This approach seeks to create places that allow the protection of genetic and behavioral skills, in line with animal welfare, and providing a positive emotional impact and ecological responsibility in visitors, our society. To achieve the well-being of some and the awareness of others is the ultimate goal of the space-design.

EVALUATION OF THE ENVIRONMENTAL ENRICHMENT OF PRIMATE ENCLOSURES IN SPANISH ZOOS A DECADE AFTER THE INTRODUCTION OF THE EUROPEAN UNION DIRECTIVE 1999/22/EC

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In recent decades there has been a significant increase in the number of legal regulations aimed at protecting animal welfare in various contexts. Despite this important legislative effort, it is uncommon to find studies that evaluate the real impact that such regulations have on the welfare of the animals they seek to protect. Council Directive 1999/22/EC relating to the keeping of wild animals in zoos is the first European Union legislation to regulate zoo activities in Europe. Pursuant to the objectives of this community law, Article 3 establishes a series of welfare requirements applicable to zoological parks, including "accommodate their animals under conditions which aim to satisfy the biological and conservation requirements of the individual species, *inter alia*, by providing species specific enrichment of the enclosures". Here we analyse the impact of the Directive 1999/22/EC on environmental enrichment of the enclosures for primates housed in Spanish zoos. More specifically, we present the results of a longitudinal study in which we compare the suitability of the enclosures at the time of the implementation of the Directive 1999/22/EC through Spanish Law 31/2003 (2003-2004; 285 enclosures from 47 zoos) and a decade later (2016-2017; 322 enclosures from 41 zoos). The evaluation of the enclosures was carried out in both periods through the application of an evaluation guide specifically developed for this task. A team of seven biologists and veterinarians with broad experience in the zoo profession and in zoo inspections participated in the design of this guide. We assessed enclosure suitability by evaluating in each enclosure seven criteria related to the provision of certain environmental resources (space availability, resting spots, social environment, temperature control, water supply, etc.), needed by an animal to satisfy some of its main biological needs (therefore improving their welfare). An enclosure was considered to provide a suitable environment for the species housed only when all seven criteria were fulfilled. Our results showed a significant increase in the percentage of enclosures that met all seven criteria after introduction of Directive 1999/22/EC (54.39% in 2003-2004 to 87.88% in 2016-2017). They also showed an increase in the percentage of zoos in which all of their enclosures met all seven criteria (19.15% in 2003-2004 to 51.22% in 2016-2017). Nevertheless, our study also showed that there were still zoo enclosures in need of improvement (mainly in what refers to the size and composition of social groups housed).

WILD BOAR SYNURBIZATION IS DETRIMENTAL TO WILD BOAR HEALTH AND WELFARE

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Management of wild boar (Sus scrofa) presence in urban environments faces specific challenges. While short-term management of conflicts derived of wild boar presence in urban environments strongly relies on lethal control, part of the citizenry opposes to lethal control and even defends cohabitation. We hypothesize that urban environment is detrimental for wild boars health and welfare, which may be a better argument to (1) achieve a consensus on the inconvenience of wild boar presence in the urban areas and (2) gain support for wild boar management measures from stakeholders currently against them. Between 2015 and 2018, 860 wild boars were hunted or captured and euthanized for management purposes in urban (n=601) and forestry (n=259) sites in the Metropolitan Area of Barcelona. Necropsy findings and lesions were described and those non-attributable to capture method classified using a Severity Score ranging 1 (less severe) to 3 (more severe). Dataset was analyzed by means of Principal Component Analysis and Hierarchical Clustering on Principal Components. We found significant evidences indicating that wild boars ranging in urban environments are more likely to suffer severe traumatic injuries, attributable to vehicle collision, dog attacks and even poaching, resulting in a shorter life expectancy. Hence, urban environment is definitely not a suitable ecological niche nor habitat for wild boar, resulting in a higher probability of decreasing fitness, health and welfare. In addition, despite wild boar lethal control is not desirable, it is up to date necessary in urban environments. Hence, promoting cohabitation with wild boar in urban settings is not desirable, as it not only compromise human, but also WB safety.

Oral session 3: New approaches and technologies for improving animal welfare

METHODOLOGY OF THE COMBINATION OF GEOLOCATION COLLARS AND BLUETOOTH EAR TAGS TO VALIDATE COW/CALF RELATION IN EXTENSIVE FARMS IN SPAIN.

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There is an increasing demand from consumers for more information on food quality, safety, production conditions and traceability. For this reason, the extensively livestock sector needs to innovate in the tools to guarantee full transparency and traceability along the supply chain. The combination of localization devices (geolocation collars) and Bluetooth low energy (BLE) ear tags can not only provide relevant information on the location, health, reproductive conditions and welfare status of individual animals, such as cows and their calves but also on their relationships and behaviour under grazing conditions. The main objectives of this work were to use a system based on the internet of things (IoT), the use of technologies that connect, process and exchange data with other devices over communications networks to: (1) assess grazing patterns and affiliative behaviour of calves with their mothers and other adults and (2) to evaluate how the weaning procedure develops. The performance of the technology was tested in an extensively reared herd of beef cattle in Catalonia, where calves are grazing and nursing with cows, during the first six months of life. We identified cow-calf couples and 25 cows were fitted with geolocation collars connected to a GSM network and 21 calves with a BLE ear tag during the summer. Every 30 minutes, the geolocation collar transmitted a signal of their location and the number of times that a BLE ear tag was close to it, thus BLE cannot work independently of the geolocation collar. A mixed effect model (GLMM) was used to analyse the number of signals as a function of time. Results show that cows with a geolocation collar received more BLE ear tag signals throughout time from their calves than from other calves of the herd (12.87 signals/day vs. 2.59 signals/day; $P<0.001$). In addition, space variables like geographic coordinates and time from geolocation collars combined with BLE ear tags allowed to establish pasture areas used by cows and calves, demonstrating that the calves remained for six months next to their mothers. This technology could be used in the long-term substitute periodic in situ controls used for traceability to communicate to consumers information like how long-time calves remain with their mother or grazing zones.

CHAID DECISION TREES: A TOOL TO IDENTIFY THE MOST CRITICAL ANIMAL WELFARE INDICATORS IN BROILER FARMS

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Broiler welfare assessment protocols resulting from the AWIN® and Welfare Quality (WQ) projects are based on the collection of indicators to reflect the welfare status of broiler flocks. This information, although useful for welfare certification purposes, could be in practice too complex for some farmers to apply. Thus, identification of key indicators that would help a farmer to improve its flock welfare while maximizing chances of a successful broiler welfare inspection would be valuable. In the present study, 20 fast growth broiler flocks were assessed by collecting on-farm welfare indicators defined in each protocol and scored according to the AWIN® and WQ methods. Given that the WQ method requires slaughter information to obtain final scores, and this information was not available, identical, simulated values for each slaughter welfare indicator were assigned to all flocks. Then, a machine learning approach was used for the processing of collected data, with the goal of identifying the reduced number of key indicators. Discrete categorized data classification, prediction, and interpretation was assessed using the Chi-squared Automatic Interaction Detection (CHAID) decision tree algorithm. Two independent analyses were performed on the complete data set, one for each sub-set of indicators corresponding to AWIN® and WQ assessment protocols. The dependent variable was the final score of each farm obtained with each welfare assessment protocol. The resulting AWIN® derived tree was distributed in 4 branching levels and 19 nodes, 12 of which were considered terminal nodes (i.e. nodes assigning a final classification category to the corresponding flocks). The most contributing variables to build the classification tree, and with greater statistical significance ($P<0.05$), were percentage of lame, small and sick birds, bedding quality (0 to 4 score) cumulative mortality (%) and initial stocking density (birds/m^2). On the other hand, the resulting decision tree for WQ protocol was distributed in 3 branching levels and split into 11 nodes, 7 of which were considered as terminal nodes. Bedding quality, cumulative mortality, footpad dermatitis (FPD) and birds/drinker were the indicators which significantly contributed to build the classification tree ($P<0.05$). Both protocols agreed on bedding quality and cumulative mortality as discriminatory criteria contributing to the final flock classification score. In conclusion, CHAID decision trees may serve as a working framework to identify the different key indicators that will allow producers to monitor their flocks most efficiently, while improving broiler health and welfare and contributing to successful animal welfare audits.

ASSESSMENT OF THE HEALTH, HOUSING, AND FEEDING WELFARE DOMAINS IN DAIRY COWS, BY LABELLING THE NORMAL RANGES OF PLF TRAITS – EXPERIENCE FROM CLEARFARM PILOT STUDIES

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An algorithm for the constant monitoring of dairy cow welfare, integrating Precision Livestock Farming measurements (PLF: sensors' technologies), veterinary and production records, is currently being developed. Traits provided by neck mounted accelerometers and ruminal boluses were collected daily for three months from 300 dairy cows from six commercial farms located in Finland, Italy, and Spain. The present study aims to suggests a method to integrating PLF data to monitor cow welfare, including health, feeding, and housing domains, by labelling the daily values of each PLF trait. Range values considered as normal (based on scientific literature) were expressed as mean ± SD. Welfare aspects for each domain that could be detected by sensor data were identified (mastitis, lameness, metritis, pneumonia, acidosis, thermal comfort, comfort around resting, adequate water and feed intake, and nutrition status). The labelling system consisted in assigning a daily score to each trait, from 0.0 to 1.0, depending on whether it was within or below/above its normal range. The better was cow's welfare, the more the score is close to 1, and viceversa. Ranges taken as normal were interpreted differently depending on the welfare aspect being sought (i.e., rumen temperature range (as a proxy of body temperature) was 36.7ºC to 39.87ºC; above, heat stress was assumed, and above 40ºC, fever or subacute rumen acidosis were assumed (considering veterinary records)). For some traits, only values indicating a problem (rumen pH <5.6; SCC >200.000; eating time <3702 min/day) were labelled as out of range. Health, housing and feeding domains' scores, respectively, were the averages of each PLF daily score that better contribute to the assessment of each one. Health assessment included time spent lying, ruminating, eating, walking, and standing, rumen temperature and pH, drinking times, and somatic cells count (SCC). Feeding assessment considered time spent eating, ruminating, rumen temperature, and drinking times. Housing assessment included time spent lying, ruminating, and rumen temperature were included. For each welfare problem, a severity weigh was assigned (from 0 to 100, being 100 for an animal whose PLF traits remained with the normal range that day). Then, a global welfare index was calculated, by averaging health, housing, and feeding domains' scores, and applying weightings on the days in which there was a welfare problem. Global scores were: cows with no welfare problems 92.9, abomasal displacement 88.3, acidosis 76.9, pneumonia 72.4, mastitis 68.28, moderate lameness 47.5, and severe lameness 44.6.

ADVANCING CATTLE BEHAVIOR AND WELFARE THROUGH PRECISION AGRICULTURE WITH A GLOBAL POSITIONING SYSTEM-ACCELEROMETER DEVICE

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Cattle production across remote landscapes and diverse climates can be challenging. In fact, cattle producers may not have the time or labor to observe animal daily and their health and welfare could be compromise. Animal welfare and health can rapidly deteriorate with illness, thirst, or acute stress. Fortunately, new low-cost precision agriculture devices (PFD) can optimize data collection rates for long-term animal welfare data collection. The purpose of the current study was to establish a proof of concept to characterize cattle behavior and subsequent welfare using PFD. The data used for training the machine learning algorithm and subsequent behavior and indirect welfare classification were derived from sensors integrated into an Arduino microcontroller system that made our global positioning system (GPS)-accelerometer device. During 2022, three dairy cows housed at the University of León Farm were equipped with a Knight GPS cow collar and integrated GPS-accelerometer device that collected 72 hours of behavioral data. The GPS coordinates were set at 10-minute intervals with movements recorded on a three-axis accelerometer at 2Hz. Cattle were observed daily for a total of 10.5 hours, whereby researchers used an Excel file with spinners that simultaneously recorded the duration of a behavior—drinking, grazing, grooming, lying, standing, ruminating, walking and eating from bunk—with a specific date and time. Observational data were then used to train machine learning algorithms to classify cow behavior, which included grazing, walking, standing, grooming, lying, ruminating, and drinking. We used Random Forest procedures to predict cattle behavior. Our data demonstrated that the proof of concept indeed worked. Specifically, 75.6% of the behaviors were classified correctly with a kappa statistic of 0.56. We noted that several behaviors produced similar accelerometer signals that were difficult to separate. For example, the signals between cows standing and either lying or ruminating were similar. Additionally, we experienced that it is important to ensure the quality of the GPS-accelerometer data collection prior to deploying the equipment for research purposes. Preliminary analyses from our proof of concept towards measuring animal behavior suggest that we can improve the efficiency between data collection and statistical analysis, which has potential to develop automatic scientific parameters of welfare within this field of research.

HOW ANIMAL WELFARE RESEARCH IN ZOOLOGICAL INSTITUTIONS CAN CONTRIBUTE TO SPECIES CONSERVATION

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Animal welfare research in zoological institutions (zoos, aquaria, rescue and recovery centers, conservation centers, etc.) has increased in the last decades as a consequence of the growing awareness of the welfare of captive animals. In addition to ethical, legal and social reasons, wild animal welfare should also be promoted because of its relationship with species conservation and biodiversity protection. Improving and protecting the welfare of animals in zoological institutions has proved to be a crucial element for them to achieve their objectives of conservation, education, and research. Moreover, both fields of animal welfare science and species conservation are clearly interconnected and have recently led to the creation of different conceptual frameworks such as “conservation welfare” or “compassionate conservation”. In this regard, animal welfare research in zoological institutions can contribute to conservation in different ways: 1) by increasing basic knowledge of wild species (that are, in general, poorly known) in areas such as behavior, physiology or cognition, among others; 2) by detecting, describing and/or delving into wild species-specific needs and modulating factors; 3) by identifying conservation and welfare threats, and by studying and characterizing their effects (possible adaptations, short and long-term consequences, etc.); 4) by developing welfare indicators that can be used in conservation research; and 5) by improving the tools and strategies for caring for and monitoring animals under human care, and thus contributing to the following “welfare cascade”: Better animal (and human) welfare – Better zoological institutions – Better wildlife research, education and conservation actions. In conclusion, animal welfare is closely interconnected with conservation of wild animals in different ways, including wild animal welfare research. This presentation aims to underline the benefits of wild animal welfare research for species conservation, and to encourage animal welfare researchers to work with wild animals in zoological institutions and in the wild.

ASSESSING MAMMAL TRAPPING STANDARDS IN WILD BOAR DROP-NET CAPTURE

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Applying contemporary trapping standards when capturing wildlife, regardless of the purpose, should no longer be an option, but a duty. However, the harsh reality is that many wildlife traps continue to be widely used without any or poor evaluations of trapping standards, due to lacking regulations, supervision or control mechanisms and, probably, political will. Conversely, the need for updating the Agreement on International Humane Trapping Standards (AIHTS) in order to improve animal welfare standards and test procedures has been long stated. Increasing wild boar populations originate a growing number of conflicts and hunting is the only cost-effective management option in most cases. However, new scenarios where hunting is unfeasible emerge and trapping necessities cope with lacking regulatory frameworks and technical guidelines. In this research, we evaluated drop nets, a capture method not considered by the international trapping standards, to capture Eurasian wild boar (*Sus scrofa*), a wildlife species not included in the list of mammal species under the scope of the AIHTS-. Less than 20% (15%; n=3) of the captured and necropsied wild boars (n=20) presented moderate (skeletal muscle degeneration ~capture myopathy; n=2) or severe (severance of major ligament; n=1) injuries attributable to the capture method, hence fulfilling the acceptance thresholds of the outdated AIHTS. On the other hand, according to a new proposal for international trapping standards which expands on the indicators of distress to be considered and establishes stricter thresholds of acceptance, it is not clear if drop-nets pass the evaluation. The capture success and selectivity were 100%, as ensured by operator-driven triggering, which should be considered the main strengths of this method, together with the minimization of animal suffering owing the short duration of the stressful situation. Additionally, in spite of the socially adverse environment, with people contrary to wild boar removal from urban areas, no disturbances against the capture system or operations occurred. This is the first assessment of a drop-net capture method according to internationally accepted mammal trapping standards, with unconclusive results. However, to our opinion, this is due to lacking suitable evaluation procedures and thresholds of acceptance, as both outdated and new trapping standards fail to consider non-mechanical, operator-triggered capture systems. Compared to other live-capture methods, drop-nets minimize the duration of the stressful situation -at the expense of a strong adrenergic acute response-, maximize the probabilities of capturing entire sounders of prosocial species, which may be also considered as more humane, and has the ability to coordinate higher values of capture success, absolute selectivity and adaptability to difficult environments.

Posters Presentations

Poster session: Indicators to assess animal welfare

NEW POTENTIAL INSIGHT FOR CETACEAN WELFARE ASSESSMENTS: MOLECULAR DETECTION OF CETACEAN POXVIRUS THROUGH A NON-INVASIVE SKIN SAMPLING DEVICE

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Characteristic poxvirus-like lesions have been reported as a potential general health indicator in both free-ranging and under human care odontocetes (CePV-1) and mysticetes (CePV-2). There is an overall agreement that these distinguishable lesions are caused due to chronic environmental disturbances leading into immunosuppression and, therefore, more susceptibility to disease. Considering health as an important aspect of welfare, the present study seeks to encourage these lesions as potential “animal-based” indicator in cetaceans’ under human care welfare assessments. For this propose, other diagnostic methods apart from visual appraisals are needed to correctly corroborate CePV infection in those lesions. Therefore, twelve tattoo-like-lesions from two stranded cetaceans on Canary coasts were sampled through skin biopsies. Additionally, aiming to address their intrusiveness, sampling through cytology cell samplers (CCS) as a non-invasive device to detect CePV-1 was also performed. In order to compare the reliability from both skin sampling methods, two different genomic extraction protocols were used, DNA Tissue Kit S™(QuickGene, Kurabo, Japan) and DNeasy™ Blood and Tissue Kit (Qiagen, Inc., Valencia, CA). Subsequently, molecular detection of CePV-1 was carried out through a q-PCR. Our findings show that, through the first extraction kit, a percentage of positivity of 83.3% with CCS was obtained compared to 91.7% with biopsies. However, better results were gained with the second extraction kit with 100% of positivity using CCS. Hence, skin sampling making through CCS can be considered as a promising method for the detection of CePV-1. However, further investigation is needed to address the uncertainties involved and ensure the potential of the use of this non-invasive method in cetaceans under human care.

STRESS CARDIOMYOPATHY: AN IMPORTANT COMPONENT IN CAPTURE MYOPATHY SYNDROME IN LIVE-STRANDED CETACEANS

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In recent decades, efforts have been made to promote and improve the well-being of free-living cetaceans, but unfortunately, they continue to be threatened on a daily basis. It is known that capture myopathy is a multifactorial syndrome that occurs as the result of the stress during and after capture, handling, restraint, and transport of wild animals, and it has been described for many species of cetaceans. Nevertheless, the characterization of the acute cardiac injury - an important component of this syndrome - is still scarce. Several authors suggest that cardiac damage seems to play a central role in adverse responses to stress in cetaceans. For this reason, it is proposed that these animals could be particularly predisposed to develop stress cardiomyopathy, comparable to the one in humans. Based on the above, the research presented was designed with the main aim of characterizing the cardiomyopathy due to stress in stranded cetaceans. This was achieved using, for the first time, biochemical analysis of cardiac troponin I (cTnI), as a specific cardiac marker in cetaceans. Onward, these results were correlated with morphological lesions in the damaged cardiomyocytes, detected through histological, histochemical and immunohistochemical studies. Through this investigation, which consisted on a PhD thesis presented as the compendium of four articles, published in peer-review journals with high scientific impact, it is concluded that: 1) cetaceans that die during and/or after stressful events such as live-strandings develop injuries comparable to lesions (vascular changes, acute degenerative changes, inflammatory cell infiltration) observed in humans with stress cardiomyopathy, thus demonstrating that cetaceans are susceptible to this pathology; 2) the first normal reference range, in the scientific literature, for cTnI in bottlenose dolphins, born and maintained under human care, is 0 to 0.0256 µg/L; 3) live-stranded cetaceans develop an acute stress cardiomyopathy characterized by a serum increase of cTnI, which correlates with tissue depletion of cardiac troponins, in injured cardiomyocytes; and 4) the use of the clinical determination of serum cTnI for the diagnosis and decision making in stress cardiomyopathy in live-stranded cetaceans is validated.

BIOMARKERS IN SALIVA: THINKING OUT OF THE BOX

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The use of saliva as a biological sample has many advantages, being especially relevant in those species where the blood collection is highly stressful and painful, both for the animal and the staff in charge of the sampling. In this study we will provide information about the possibilities that the saliva can offer for the measurement of biomarkers in order to evaluate animal health and welfare. This information will compromise a general review and also results from our research team obtained in different animal species such as pigs, cows or horses. In particular, we will review the use of saliva to measure different biomarkers of: stress, inflammation, immune response and redox homeostasis. In addition, it can be used for diagnosis and detection of infectious diseases. Selected biomarkers from each of the different points will be presented and data will be provided about their physiological basis, how they can be measured, and their interpretation. In addition, the use of saliva for the measurement of positive emotions will be addressed. This is made by the measurement of oxytocin, which can be presented in different forms and measured with recently developed assays in an easy and accurate way. Finally, the use of saliva for the detection of sepsis will be analysed. This is made by the measurement of procalcitonin and represents an easy and welfare friendly to evaluate the health of our animals and contribute to the reduction of antibiotic resistance. This presentation can contribute to a better understanding of the possibilities of the use of saliva in animal welfare and increase its use and applications.

DAIRY COWS' VOCALIZATIONS CHARACTERIZATION DURING DRY-OFF

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In cattle production, bioacoustics have been applied to monitor animal welfare status through vocalizations associated to illness, oestrus detection, and negative emotions. The dairy production system involves different physiological states of the animals, and some of them might involve some degree of discomfort. In the drying period, an abrupt cessation of milking can cause pain, a diet change towards a low-energetic feed and regrouping cows into a new pen may lead to stress. This study aimed to detect and characterize acoustic features of dairy cows' vocalizations to determine whether they can be associated to the potential pain or stress associated to physiological states such as the dry-off period (end of lactation cycle). Handheld recorders with an environmental microphone were placed in a pen with 3 cows starting the dried-off (100 hours recorded) period, and in a production pen with around 100 milking cows (200 hours and 56 minutes recorded). The cows had a milk production of 32 liters per day when the dry-off process started, which may lead to pain if dry-off is performed abruptly. Recording campaign started when the cows were moved and regrouped into a new pen and feed with a lower energetic diet. Several relevant vocalizations recorded on the two pens were manually analyzed using the Audacity® software, focusing on the intonation, duration, and volume observed on the spectrogram. Three kinds of vocalizations were identified: i) short vocalizations with an ascendent intonation (*Asc*); ii) repeating short vocalizations with descendent intonation (*Des*); and iii) long vocalizations with descending intonation (*LDes*). Once the vocalization categories were identified, their appearance was contrasted with the physiological status of the animals in each pen. *Asc* vocalizations were more frequent in the animals during the drying-off period compared to cows in milking pens. This increment and change of pattern of vocalizations can be explained as a behavioral response of cows to the stress that may produce the interruption of the milking routine, or as a complaint about the change of feed quality diet or social regrouping. These results may help to interpret the welfare of dairy cows based on their vocalizations. Further research is needed to relate cows' vocalizations and the stress of the dry-off process using objective indicators as biomarkers or behavioral observations that may confirm the vocalizations' information. Farmers might benefit from this tool, allowing them to quickly intervene in situations impacting animal welfare.

THERAPEUTIC RIDING AND RIDING SCHOOL SESSIONS: EVALUATION OF THYROID RESPONSE IN HORSES IN ORDER TO EVALUATE THE EFFECTS OF DIFFERENT KIND OF RIDERS

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Total (T_4, T_3) and free iodothyronines (fT_4, fT_3) were compared in six Therapeutic Riding Horses ridden by mentally-unable (Group A) and able-minded riders (Group B), in order to investigate Thyroid gland hormonal response in horses and to check the effects of different kinds of riders. The main hypothesis is that Thyroid response in horses would be less reactive to mentally-unable than to able-minded riders, due to increasing levels of horse control by the able-minded riders. The circulating iodothyronine changes could be used as physical and/or mental exercise stress markers. Six horses were randomly ridden in the same setting by two groups of riders (six inexperienced rider *per* group). Each rider was randomly assigned to a horse for each session, according to a cross-over study design, where each horse had one session/day, for two days/week, with alternatively therapeutic riding or recreational riding in 3 consecutive weeks. The horses followed the same routine at all sessions both with Group A and Group B riders. Each session lasted approximately 60 min, during which riders rode the horse for about 30 min, while, for the remaining time, they led their horse to the tacking area and learned skills of grooming and un-tacking. Exercise consisted of walking and light trot. Hormones' concentrations were determined on a different sampling time (S): resting day (S0), before (S1), and at 5' (S2), 15' (S3) and 30 min (S4) after session. Statistical analysis was performed with GraphPad Prism, version 5.0. A two-way analysis of variance with repeated measures was applied to evaluate both differences and interaction between sessions and sampling time on hormonal changes of horses. Exercise induced, in the 1st week, a significant increase of T_3 concentrations after session in both groups. FT_3 concentrations showed a significant decrease, after all session, in both groups. Typology of riders affected both T_3 and fT_3 changes. T_3 concentrations showed a significant increase in Group B than those in Group A, both in the 2nd and 3rd week. FT_3 concentrations were significantly lower in Group B than those in Group A, after sessions, in all weeks. Results suggest that exclusively T_3 and fT_3 changes vary with the different riders, showing that such changes could be due to an effect of rider's handling. Thus, although sessions workload was the same, the significantly T_3 and fT_3 changes after the sessions of the different Groups, could be related to different effects of horse-human interaction.

THE EFFECT OF UNDERNUTRITION AND SUPPLEMENTATION WITH HYDROXYTYROSOL IN LATE PREGNANCY ON BEEF CATTLE SOCIAL BEHAVIOR

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Social behavior can be used as a welfare indicator informing an animal´s adaptation to its production environment challenges. The present study is part of a larger project investigating fetal undernutrition and hydroxytyrosol (HT) supplementation (a proved antioxidant) in a beef production system (FETALNUT; grant no PID2020-113617RR-C22). The specific objective was to assess the effects of restricted feeding on beef cattle social behavior during the last trimester of pregnancy. Cows from Parda de Montaña and Pirenaica breeds were allocated to four treatments, (2x2 factorial design), by the level of maternal feeding (100 vs. 60% of estimated total requirements) and HT supplementation HT (0 or 178 mg HT/kg of unifeed) on mixed breeds pen. The experiment started at the morning unifeed delivery, lasting two hours, as suggested by the Welfare Quality® protocol. Individuals' exact identities and the location at the feed bunk were collected at the observation unit. Information (indoors 2021-22) from 1420 behavioral scans (10 min duration, segments of 4-7 cows) was obtained, and 109 animals were embedded in this analysis (4 observers). The frequency of behaviors was expressed as the number of animals affected from the total number assessed on each scan. Different affiliative and cohesive behavior (licking, sniffing, and vocalizations) were recorded. Preliminary analysis shows the undernourished group performed more cohesive behaviors than the group fed 100% energy requirements (0.42 vs. 0.12%, $P<0.001$) and more head rub and tongue playing as specific behaviors, whereas no differences were observed in agonistic encounter behaviors. Restricted-fed Pirenaica cows performed more vocalizations than their control counterparts. Likewise, differences were observed in tongue playing according to HT supplementation, which is more frequent in the non-supplemented group of Parda breed. The two breeds performed similarly in total frequency of behaviors. However, both breeds performed significantly more steps back, head shakes, brushes, tongue playing, and headbanging, but only Parda vocalized more after the meal. Parda dams located in a peripheral position tended to vocalize more than those at central position of the feeder. There were no differences in vocalizations in Pirenaica breed regarding the feeding time or position at the feed bunk. Unlike Parda de Montaña breed, Pirenaica breed in a peripheral position step-backs more frequently and tended to lick more than those in a central position. Overall, undernutrition and HT supplementation seem to modify social and other behavior, interplaying with the cattle breed. Further analyses are needed before recommending the inclusion of antioxidant supplementation

THE EFFECT OF MATERNAL NUTRIENT RESTRICTION AND HIDROXITIROSOL SUPPLEMENTATION IN LATE PREGNANCY ON BEEF COW-CALF BONDING BEHAVIORS

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Prepartum nutrition may affect maternal-young bonding through physiological and behavioral adaptations. This study evaluated the effects of prepartum maternal nutrition and hydroxytyrosol (HT) supplementation (a proven antioxidant compound) on beef cow-calf behavior during the last trimester of pregnancy. Forty-eight pairs from Parda de Montaña (n=25) and Pirenaica (n=23) breeds at 29±6.5 days postpartum were observed during afternoon nursing regrouping (15:00 h) after seven h of separation without fence contact (25 m apart). The prepartum cows received 100% or 60% of their energy requirements and 0 or 190 mg HT/kg of diet. The postpartum cows were loose-housed with a diet meeting 100% of their energy requirements but in separate pens depending on previous prepartum treatment (12 cows per pen, half of each breed). Each recording day, six observers controlled one cow-calf pair. The variables registered were 1) time from doors opening until rejoining and 2) the occurrence of maternal behaviors during the minute just after bonding. Most cows nursed their calves within the first 5 min after recoupling (89.6%, 43/48), regardless of the evaluated effects. The time until recoupling was not affected by prepartum feeding, HT supplementation, breed, or calf sex (0.18±0.071 log-min or 1.51 min, P>0.10). However, the cows that showed prepartum maternal tongue rolling occurrence (16.6%, 8/48) showed a longer time to meet their calves (0.35±0.14 vs. 0.01±0.06 log-min, or 2.24 vs. 1.02 min, P<0.05). Likewise, more Parda de Montaña cow-calf pairs took >2 min to rejoin than their Pirenaica counterparts (36.0%, 9/25 vs. 8.7%, 2/23, P<0.05). The proportion of calves moving their tail while suckling was similar between groups (75.0%, 36/48, P>0.10). The proportion of cows and calves vocalizing while recoupling did not differ across groups (31.3%,15/48 in the case of cows and 10.4%, 5/48 in the case of calves, P>0.10). There were no differences across groups in the proportion of calves that attempted to suckle foster cows either (35.4%, 17/48, P>0.10). However, more undernourished cows during the prepartum licked their calves during nursing (25.0% or 6/24 vs. 66.7% or 16/24 in 100% and 60%, respectively), but any other effect influenced allogrooming activity (P>0.05). The proportion of cows sniffing their calf around nursing did not differ across groups (47.9%, 23/48, P>0.10). In conclusion, prepartum feeding level and antioxidant supplementation did not affect cow-calf bonding behaviors. However, a higher proportion of undernourished cows during the prepartum groomed their offspring during nursing.

AN AUTOMATED ASSAY FOR FERRITIN IN SALIVA OF PIGS: ANALYTICAL VALIDATION AND EVALUATION IN DIFFERENT IRON STATUS

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Ferritin is a highly sensitive biomarker that decreases in cases of deficit of iron and can be used for the diagnosis of ferropenic anemia. Piglets are susceptible to developing this anemia during the neonatal period if they are not supplemented with iron intramuscularly and, their growth and health status could be affected, and consequently their welfare. Over the past few years, saliva has been used in several species to measure levels of ferritin for diagnosis or research purposes. To our knowledge, ferritin has not been measured in saliva of pigs, species in which this specimen is especially useful due to its non-invasive collection; in contrast of blood sampling that it is a traumatic collecting method that affects their animal welfare during sampling. The objective of this study was to validate an automated assay for measuring ferritin in porcine saliva and, to assess salivary ferritin levels in piglets treated with hexogen iron (IM) and compare with controls how ferritin can change in saliva of piglets supplemented and non-supplemented with iron intramuscularly. Saliva samples were collected using saliva collection tubes (Salivette, Sarstedt, Aktiengesellschaft & Co., Nümbrecht, Germany) and synthetic sponges of pigs from the experimental farm of the University of Murcia, Spain. An analytical validation was made of a ferritin heterologous immunoturbidimetric assay (Biosystems SA). Measurements were made on the automated chemistry analyser Olympus AU 400 (Olympus Diagnostica GmbH, Hamburg, Germany). In addition, ferritin was measured in two groups of pigs: one supplemented with an IM injection of hexogen iron (Group A, n=22) and without injection of supplemental iron (Group B, n=20). Results were analysed by Mann-Whitney statistic test to assess differences between groups. Ferritin assay showed an average of intra- and inter-assay coefficient of variation of 5.0% and 5.6%, respectively. Linearity under dilution presented a linear regression equation with a determination coefficient close to 1 (r^2>0.99) and average of recovery percentage was 96.43 ± 4.41%. Salivary ferritin was lower in Group B (median (range), 11.4 (2.8-48.5) µg/L) as compared with Group A (35.70 (13.0-61.8) µg/L), *P*=0.0001. This is the first report that describes the determination of salivary ferritin in pigs. The reported automated method presents adequate precision and accuracy and was able to detect variations of this biomarker in pig saliva samples in a situation of Fe supplementation and, it could be a potential tool to detect states of Fe deficiency raising their welfare.

A COMPARISON OF FEEDING REGIMES AND THEIR EFFECTS ON BEEF CATTLE FEEDING ACTIVITY

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The daily activity budget is a useful tool that offers considerable help with making precise decisions on feeding practical strategies to enhanced cattle welfare. This study evaluated the effects of prepartum nutrition on beef cattle feeding activity during the last trimester of pregnancy. The present study is part of a larger project investigating fetal undernutrition (100% and 60% of energy requirements on maternal diet, 10.5 and 7 kg/day, respectively) and hydroxytyrosol supplementation (0 vs. 178 mg/kg of diet) in a beef production system (FETALNUT; grant no PID2020-113617RR-C22). One-hundred nine beef cows from Parda de Montaña (n=62) and Pirenaica (n=47) breeds at early seventh, the eighth, the nine and late ninth months of gestation were observed for 2 hours starting after 1-hour post-feed ration supply onwards (4 observers purposely trained for FETALNUT). According to the dietary group, both breeds were mixed and housed in loose-house pens during the indoor period. Observations were performed directly in the barn by continuous focal animal sampling. Feeding behavior in this study included the activities of eating, ruminating and standing. Individuals' exact identities and the location at the feed bunk were collected at the observation unit. Non-parametric Wilcoxon tests were used to compare treatment means. The results indicated that cows with restricted feeding spent less time eating and ruminating than the control group, but this difference was more marked in Parda de Montaña breed. There were no significant differences between the control group and the undernourished group regarding the percentage of standing animals. Higher eating rates and shorter feeding times were observed in the undernourished group compared to the control group (+23 g/min and -1.6 h/day, respectively, $P<0.001$). Antioxidant supplementation resulted in an unmodified eating rate and feeding time. Regarding control date and pregnancy stage effects, differences were observed between the beginning of the ninth month and the rest of the controls, with at least 7% fewer animals eating overall. Regarding the two peripheral positions at the feed bunk, Parda de Montaña breed repeated more than Pirenaica breed (20.0% vs. 6.5%). Similarly, an increase in animals performing rumination at the beginning of the eighth and ninth months of gestation compared to the first control was observed in both breeds. In conclusion, prepartum feeding level affected feeding activity by manipulating the time of each activity and the indirect feeding competition by increasing their feeding rates budgets, which allows for measuring such costs of feeding deprivation. However, further analyses are needed for this study.

ENDOCRINE AND METABOLIC PARAMETERS DURING GESTATION AND LACTATION IN MODICANA DAIRY COWS

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Complex endocrine and metabolic adaptations occur in dairy cows during pregnancy and lactation, which require the redirection of nutrients to support the fetal development and the milk production. The effects of different physiological stages (before insemination: non pregnancy), of gestation (<25, 26-100,>100days) and lactation (<60, 61-120,121-180, 181-240, and >240 days) on thyroid hormones, insulin, and metabolites were evaluated in dairy cows. Blood was collected every 60 days from 10 healthy multiparous Modicana cows (peak milk: 13±2kg/day at 90 lactation days), to measure circulating thyroid stimulating hormone (TSH), total and free tri-iodothyronines (T_3, fT_3) and thyroxines (T_4, fT_4), insulin (Immulite® two-site chemiluminescent immunometric assay), glucose (GOD/POD/PAP method), TG, and TCho concentrations (BT3500 Biotechnic Instruments). Experimental protocol was approved by the Ethical Committee of the Department of Veterinary Science of Messina University (code 041/2020). Animals were fed with 20 kg of dry matter/head/day as a total mixed ration of meadow hay and concentrate, integrated with dried and pitted olive cake (8% of dry matter) according to the approved UE disciplinary "QS Sicilia", as a strategy for the recovery of agro-industrial by-products. Statistical analysis (ANOVA and Tukey-Kramer tests) was performed with JMP® 16. Gestational phase showed higher T_4 at <25 and >100 than non pregnancy ($P < 0.01$), higher insulin at 26-100 d than the rest of pregnancy and non pregnancy ($P < 0.0001$), and lower glucose values at >100 d versus non pregnancy ($P < 0.007$). During lactation, the lowest insulin values were found at<60 d and the highest at >240 d ($P < 0.02$), whereas the opposite was obtained for glucose ($P < 0.01$). No other significant differences were found. It was established that at the end of pregnancy and in early lactation, dairy cows transiently experience a reduced response to insulin in the peripheral tissues, to preserve a sufficient glucose supply for the fast-growing fetus and the mammary gland. Hence, it is possible that these tissues use most of the available glucose at these stages, as confirmed by its lowest serum concentrations recorded at >100 d of pregnancy and<60 d of lactation. T_4 and insulin serve as indicators of a physiologic basal metabolic adaptation along pregnancy and lactation, thus facilitating the management of possible metabolic issues. Knowledge of hormonal changes and breed-specific metabolites allows to understand the adaptive capacity and metabolic response of local breeds that are not yet strictly selected for milk production. Project BIOTRAK Grant number 08SR1091000150 -CUP G69J18001000007

Poster session: Improving human-animal relationship and the environment

WELFARE ASPECTS IN TWO BROILER STRAINS WITH DIFFERENT GROWING RATES REARED UNDER COMMERCIAL CONDITIONS

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Societal demands for animal welfare have promoted an increase of breeding of slow-growing chickens, with longer production cycles. However, there are few studies comparing animal welfare between these strains under commercial conditions. Therefore, the aim of this study was to compare some aspects of animal welfare of a fast-growing strain and a slow-growing strain under commercial conditions. The study was performed at CITA-IVIA, Segorbe, Castellón from January to March 2022. All stocking conditions were replicated from commercial conditions: temperature, humidity, air quality, feeders, drinkers, and stocking density. A total of 204 broilers of two strains were used: 102 fast-growing broilers Ross® (F), and 102 slow-growing broilers Hubbard® (S). Both strains were housed during 63 days in order to compare both the response of the animals and age. Animals were distributed at one-day old in 12 pens with 17 animals/m2 throughout the experiment and five animals of each pen were slaughtered, and blood samples were taken by exsanguination at 21, 42 and 63 days of age, so stocking density at 42 and 63 days were 25 and 29 kg/m2 respectively. Immunoglobulins, acute phase proteins, glucose (GLU), and lactate (L) were measured. Additionally, tonic immobility test was performed at 55 days of age. An analysis of variance was performed using Statgraphics Centurion XVIII. Significant differences between strains were found for albumin (A), ovotransferrin (O), and GLU. O concentration was lower in S on day 21 (-2,4±1,2 mg/L) whereas A and GLU were higher for S on day 21 (+1,0±0,2 g/L; +0,12±0,04 g/L) and 42 (+2,0±0,3 g/L; +0,46±0,06 g/L). At 63 days old, O was higher in S (+9,4±1,6 mg/L). Regarding CRP and L, no statistically significant differences were found. During a stress response, A concentration decreases whereas CRP and O are increased. On the other side, GLU and L concentrations vary according to the level of stress. According to this, S animals seem to present a higher level of stress, although results are not conclusive. As regards to the tonic immobility test, time to recover from the test was significantly higher in S animals (3.78±0.91 min) than in F animals (1.70±0.51 min), which would also indicate a higher level of stress or fear. According to the results obtained, S animals show in general a higher level of stress, although results must be accurately studied. This may indicate that S animals present more difficulties to adapt to commercial conditions.

ADMINISTRATIVE INTERVENTION MEASURES IN CASES OF ANIMAL WELFARE DEFICIENCIES

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Veterinarians who work in the public administration as guarantors of compliance with Animal Welfare (AW) standards in livestock farms, or at the time of transport or slaughter of animals, can find themselves during inspections with complex situations which can end up in administrative files, administrative or criminal penalties depending on the degree of non-compliance with current legislation. Although in Europe there is currently a legal and moral obligation to promote humane treatment of animals by considering them beings who feel and suffer as indicated in the Treaties of Amsterdam or Lisbon, exceptionally specific and media circumstances may arise which present a difficult administrative solution, lacking, on the one hand, a clear legal framework in the legislative corpus and, on the other, specific and unique procedures for action which clearly limit the effectiveness of action in these cases. In this paper, administrative intervention measures are analysed in cases of deficiencies in animal protection based on current regulations, such as precautionary measures and accessory sanctions. The application of the different precautionary measures must be sufficiently motivated and be proportional and justified to the infraction. They have a time limit and it could be modified throughout their processing. The Spanish animal welfare regulations contemplate the seizure of animals, the suspension or stoppage of livestock activities or restrictions on the documentation of animals on a provisional basis whenever a risk to the life of the animal is determined. This rule also cites different accessory penalties such as corrective measures, the cessation of activity, the closure of establishments and the confiscation of animals. But all of them lack sufficient agility in their application. In conclusion, it can be ensured that there are currently numerous legal aspects in which to advance and clear and regulated procedures for action are also necessary so that the administrative intervention actions which are carried out comply with the basic principles of speed and efficiency and increase legal certainty of the actions with respect to those affected by the intervention as well as with respect to the intervening administrative units.

BEHAVIOUR OF IBERIAN PIGS DURING THE GROWING PHASE ACCORDING TO MANAGEMENT CONDITIONS

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The fattening management conditions in the *montanera* system (fattening based on local natural resources under extensive management in the *dehesa* ecosystem) of the Iberian pig production are regulated according to the legislation (RD 4/2014) in Spain. However, the previous production phases (e.g., growing phase) to *montanera* are not regulated. For this reason, different production systems (from intensive to extensive) exist in the growing phase of Iberian pigs. This work aimed to study Iberian pig's behaviour during the growing phase in two different management conditions. Iberian surgicaly castrated male pigs were studied during the growing phase in a large outdoor pen (LO; n=45) and in a large grassland paddock (LG; n=48). The observed behaviours were grouped according to inactivity or activity. Active behaviours included exploration, social interactions (positive and negative) and others (walk, run, drink, swim and comfort). Individual and social behaviours were collected during 19 observation days (76 hours in total) through scan sampling throughout the 104-day growing phase. The study groups were observed at the same time of day, 1 hour in the morning and 1 hour in the afternoon, each observation day. Observations were divided into two periods (summer and autumn) for data analysis. The overall results showed 81.34% of activity and 18.66% of inactivity in the observations throughout the growing phase in LG. In the meantime, the results obtained in LO showed 52.14% of activity and 47.86% of inactivity during the growing phase. Activity was influenced by season mainly in LO (22.64% more activity in autumn than in summer during the observation hours), while summer influenced activity to a lesser degree in LG (6.02% more activity in autumn than in summer during the observation hours). An enriched environment (grass, trees, ponds...) was the leading cause of a higher percentage of active behaviours (walk, run, swim…) in LG. In terms of active behaviours, the results showed a higher level of social interaction in LO (1.35%) than in LG (0.62%). Besides, fights were more frequent in LO than in LG. A higher social interaction might be caused due to a greater livestock density in LO (40 m^2/pig) than LG (3854 m^2/pig). Overall, Iberian pigs raised in grassland paddocks will be more adapted to the search for natural resources in the *dehesa* ecosystem (acorn, grass) during the *montanera* fattening than Iberian pigs raised in outdoor pens due to previous experience gained during the growing phase.

USE OF BOTANICAL EXTRACTS AS A TRANQUILIZER IN FATTENING CALVES

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The stress response induces significant behavioral, biochemical, and immunological changes that directly affect animal welfare and the productive outcomes of farms. On the other hand, the interest in phytotherapy in veterinary medicine has grown in recent years due to the need to find alternative therapies to reduce the consumption of antimicrobials. This study aimed to evaluate the effectiveness of a tranquilizer based on botanical extracts (Quiet-farm® at 5 kg / t) to reduce stress on a commercial farm of fattening calves. For the study, a total of 142 uncastrated Frisian males were used (mean age: 145 ± 0.85 days; mean weight: 179 ± 5 kg), which were randomly assigned to control group (feed no supplemented with tranquilizer) and treatment group (feed supplemented with tranquilizer). The two groups were housed in 2 different but adjoining fattening units (with the exact dimensions and characteristics), sub-divided in 4 pens (replicates) of 17-18 animals each. Several animal-based measures proposed in the Welfare Quality® for Cattle were used to evaluate the product's effectiveness. Social behavioral observations and Qualitative behaviour assessment were performed by the same observer every two weeks during the last four months of animal fattening (10 observations). Various data related to production parameters were also recorded. Non-parametric Wilcoxon tests were used to compare treatment means. Regarding the results, significant differences were observed in the emotional state of the animals, with higher scores of positive valence/mood adjectives ($P<0.05$) and lower scores of negative valence/mood adjectives ($P<0.05$) in the treatment group. At the same time, there was a lower frequency of agonistic social behaviors ($P<0.001$), as well as unwanted behaviors such as mounts ($P<0.001$), in the treatment group. In the treatment group, the presence of swelling in the forelimbs ($P<0.05$) and hindquarters ($P<0.05$) was also lower. In terms of productive results, the live weight at slaughter ($P<0.001$) and the average daily gain ($P< 0.0001$) were higher in the treatment group. The results indicate that using the tranquilizer product could improve animal welfare and the productive metrics in calf fattening. However, more studies are needed in the future to confirm these results.

HUMAN ANIMAL INTERACTION (HAI) ASSESSMENT BY USING ARTIFICIAL INTELLIGENCE

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Research in several livestock industries has shown that interactions between stockpeople and their animals can negatively impact the welfare of these animals and, therefore, its growth rate, health and productivity. Consequently, positive changes to the farmers' attitudes can enhance the animals' quality of life by improving the human-animal interaction (HAI). The main objective of the HAI 4.0 project was to obtain a reliable measure of the quality of human-animal relationships by using new technologies based on Machine Learning (ML) algorithms. An artificial intelligence system based on ML was developed to record sows' reactions after a validated HAI test based on the Welfare Quality protocol. This test consisted of three individual stages where the assessor attempted to get as close as possible to the animal without any withdrawal response. Depending on the reaction, animals were scored as 2 (the animal withdraws at the start position), 1 (the animal withdraws initially but then approaches) or 0 (the animal allows being touched without any withdrawal). Videos performing the HAI test were recorded by fixed cameras and used to obtain people and sows dataset. For the development of the artificial intelligence system a pre-trained CNN (Convolutional Neural Network) architecture for object detection, the YOLOv4 (You Only Look Once), was used. The last 3 layers of the YOLOv4 were modified to detect exclusively people and animals in the dataset of farm images called COCO (Common Object in Context). This kind of dataset, which provides 80 different object categories, allows a better training of the convolutional network since the type of image characteristics that the network learns to extract is richer than training with only a few number of categories. The correlation of the scoring obtained by the deep learning algorithm and the observer performing the test was calculated. Preliminary results indicate a correlation observer-technology of $r=0.6$ ($P<0.05$). More data are being analysed to confirm that scoring of this HAI test could be automated, and, thus, this tool could be useful to conduct on farm self-assessments or external audits. It must be considered, though, that animal welfare assessments should always include a multidisciplinary approach and not rely on a single indicator, even if considered HAI as a potential "iceberg" indicator. The automation of collection of some indicators may help to enhance continuous welfare assessment, by reducing tasks considered as time consuming and even reducing human bias.

Poster session: New approaches and technologies for improving animal welfare

TECHWEL: DEVELOPMENT OF NEW APPS FOR ANIMAL WELFARE ASSESSMENT IN POULTRY AND SWINE PRODUCTION

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Welfare has been defined as the state of an animal regarding its attempts to cope with the environment. This state needs to be assessed with different parameters to obtain a complete, objective picture of how animals respond to diverse situations. By combining different animal welfare indicators, two European research projects developed different welfare assessment and auditing protocols: Welfare Quality and AWIN®. These practical protocols include animal-based measures providing information about the individual's welfare, and resource-based measures that identify poor welfare risk factors. Researchers developed on-farm and slaughterhouse protocols that can be effectively applied to commercial conditions with minimal disturbance for animals. Despite their success, the application of these protocols requires a deep knowledge to perform on-farm and slaughterhouse evaluations, processing the collected data, and understand and interpret assessment outcomes. The main objective of the Techwel project is the transformation of assessment and auditing protocols into accessible and friendly apps. Two apps for mobile devices were created and tested, one for pigs' slaughterhouse and the other for broilers' farm and slaughterhouse. These apps were tested on-site by trained scientists, and based on tests, improvements were made by software developers. This process was repeated until a final version was built up. As a result, two apps were obtained, which will allow an extensive use of welfare assessment protocols. These apps are specially designed to be intuitive and guide the user step-by-step during the welfare assessment, simplifying the assessment procedure. The apps are easy to use, however basic training on their use, and on the assessment and scoring of welfare indicators is still needed to harmonize assessments and obtain reliable data. Main envisioned app users are certification agencies, veterinary services, technical personnel, or farmers for their own self-assessment. By using these apps, end users will be able to perform blind self-assessments, so that producers can be better prepared to successfully confront the auditing process. Nevertheless, the mathematical model to produce the overall assessment has not been designed yet. Additionally, the apps will provide an immediate visual output of the assessment results, allowing the comparison of current results with previous evaluations. Thus, they will facilitate a more efficient animal health and welfare data collection, allowing the optimization of management practices. In addition, they will facilitate risk assessment of major animal welfare problems in a standardized manner. To conclude, this project took a further step on implementing technologies in the field of animal welfare assessment.

ANIMAL WELFARE VS. SUSTAINABILITY: OVERLAPPING ATTRIBUTES AND CONSUMER BEHAVIOUR

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This bibliometric study represents the first step of a project to analyze how overlapping attributes might affect purchase decisions for farm animal products. We are interested in the intersection between known consumer behaviour issues affecting two closely related concepts: welfare and sustainability. Could consumer misconceptions about sustainability as a one-dimensional concept (environment) affect their attitude-behaviour gap regarding welfare? If consumers interpret both concepts as conflicting choices, research efforts during the last decades could be compromised due to their market-driven nature, meaning production improvements are strongly influenced by consumer demand and purchases at premium prices. We first decided to analyze the available literature to clarify tendencies and identify research gaps. We searched Google Scholar for publications in English, from 2000 onwards, considering the following keywords as inclusion criteria: farm, animal, welfare, sustainability and consumer. We found 994 documents and proceeded to adapt the inclusion criteria by selecting only research papers including at least one of the keywords in the title. We reviewed the abstracts of the resulting 123 papers to ensure adequacy with the topic under investigation which led to the final 70 papers included in the analyses. We examined papers by quantitatively classifying them according to year of publication, animal species, journal and area of publication (JCR index), and authors' origin (address) and expertise (working department). Only five papers (7.1%) were published up to 2010, while 26 (37.1%) were published in the last two years (2020-2022). Forty-five papers (64.3%) referred to farmed animals, 8 (11.4%) to poultry, 8 (11.4%) to ruminants, 5 (7.1%) talked about pigs and 4 (5.7%) about aquaculture. Papers were published in 47 different journals, 42 (60.0%) within the JCR category "Agriculture and Biological Sciences", 11 (15.7%) in "Environmental Sciences", and five (7.1%) in each "Health Sciences" and "Business, Management and Accounting". Regarding the authors' expertise, 87.0% worked in universities or research centers and 8.0% in industry (the rest were unclear). 51.9% worked at departments specializing in Animal and Agricultural Sciences (including animal welfare and agricultural economics), 18.0% in Business or Law (including marketing and consumer behaviour), 5% in Environmental Sciences (including biodiversity) and 4.5% in Food Sciences (15.8% were unknown). Lastly, 61.6% of authors worked in Europe, followed by North America (17.1%), Oceania (8.8%), South America (6.9%) and finally Asia and Africa (5.6%). Our next goal is to perform a qualitative analysis of the papers' contents to investigate the topics introduced in this abstract.

USE OF ANESTHETICS AS SEDATIVES FOR FISH LIVE-TRANSPORTATION: ARE THEY USEFUL TO MITIGATE STRESS RESPONSES?

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The use of anesthetics to mitigate stress responses has been shown to be useful for common processes in aquaculture such as batch-classification, live-transportation and fish-handling in general. Several synthetic agents, and organic extracts and essential oils, have been extensively tested under laboratory conditions for different cultured species. However, all these agents induce additional physiological responses that alter the homeostatic state of animals, conditioning their own responses to stress. This work aims at summarizing the main results described in two studies, where four anesthetics (MS-222, clove oil, AQUI-S® and etomidate) were evaluated as stress relievers during live-transportation of the gilthead seabream (*Sparus aurata* L.), an emblematic species for Spanish, European and Mediterranean aquaculture. In both studies, the transport simulation procedure with MS-222 and clove oil, and with AQUI-S® and etomidate was identically performed. Thus, immature seabream juveniles (w_i ~ 40-60 g) were placed in a mobile device that housed the experimental aquariums, which was moved for 6 h in intervals of 5 min of shaking and 15 min of rest, to emulate the vibrations and movements that are generated during a transport process. The sedative concentrations employed: i) 5 ppm of MS-222; ii) 2.5 ppm of clove oil; iii) 2 ppm of AQUI-S® (as active isoeugenol concentration); and iv) 0.15 ppm of etomidate, were obtained in a previous characterization of the induction to anesthesia for this species, and considering fish-size and water temperature. After the transport, fish were transferred to similar aquariums with clean water and allowed to rest for 18 h for their recovery. The results showed that the use of anesthetics as sedatives for seabream live-transportation presented more disadvantages than benefits. Although the compounds are relatively inexpensive and easy to use, they do not seem to attenuate the stress responses during transport. Furthermore, the selected concentrations elicited additional physiological responses on the seabream juveniles, mainly in plasma and liver metabolic parameters, which were reflected both at the end of the transport process and after the recovery period. These responses were anesthetic-specific and affected the regulation of the stress system, the intermediate metabolism and the osmoregulatory capacity of the fish. Although the use of these compounds is not dismissed, the physiological side-responses described must be taken into account to guarantee fish welfare.

CAN ACTIVITY LEVEL DETERMINED BY A COMPUTER VISION SENSOR BE CONSIDERED AS A POTENTIAL WELFARE INDICATOR IN PIGS?

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Observing behaviors on farm by naked eyes may produce biases due to the presence of observers. Additionally, the analysis of videos recorded continuously can be time-consuming. Change of the activity level, however, has been found to be associated with health or welfare problems in pigs. The aim of the pilot study was to investigate whether the activity level of the group-housed pigs, collected by a computer vision sensor (Copeeks SAS, France), can be a potential indicator to assess animal welfare. The input of the activity level is obtained by plotting points on the animals and tracking the movement of the animals from the camera. On the other hand, the output of the activity level is calculated by a confidential algorithm of the sensor which is presented in the numeric form. As the distance of the movement and the speed of the animal are not tracked, the activity level determined by the sensor has no unit. The activity level is given the average of the activity of all the animals within a pen approximately every 30 minutes from 07:00 to 22:00. Eight sensors were installed on three farms: one farm of a nursery unit (two sensors for two pens, 100 pigs/pen), another farm of a fattening unit (two sensors for four pens, 13 pigs/pen), and the other farm of nursery (two sensors for four pens, nine pigs/pen) and fattening units (two sensors for four pens, 10 pigs/pen). The study period was from March to June 2021. Statistical analysis of the activity level was carried out in RStudio with a linear model, which included the production stage, day, and sensor (i.e., pen) as the explanatory variables, and the activity level as the responsible variable. On average, the activity level of nursery pigs during the study period was 38.9 ± 0.21 and that of fattening pigs is 31.0 ± 0.21. Preliminary results showed that production stage did not affect the activity level ($P > 0.05$), but day and sensor did ($P < 0.05$), suggesting that the activity level differed between days and pens. Analysis from a previous abstract showed that the activity level was also affected by the environmental parameters (e.g., NH_3, CO_2, humidity) ($P < 0.05$). Activity level determined by the sensor may be a useful reference, and ongoing data analysis which includes veterinary records and salivary stress biomarkers will be performed to determine the potentiality of an on-farm welfare indicator.

LINKING WHALE WELFARE, HUMAN WELL-BEING AND ENVIRONMENT UNDER THE 'ONE WELFARE' FRAMEWORK

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One Welfare describes the interrelationships among human well-being, animal welfare and the environment. Nowadays, several ecosystem services (i.e. contributors to human well-being) are being threatened due to unprecedented changes in ecosystems and biodiversity loss. In this context, animal welfare may play an important role as many biodiversity conservation issues are animal welfare issues too, and vice versa. Great whales have been relevant in the recent history of human-animal relationships: their populations were reduced in less than 25% during the 19th century and they remain an icon for the environmental movement. After a complete ban on commercial whaling, concerns are focused on other rising threats that could be driving a major problem for biodiversity conservation: climate change, noise pollution, chemical pollution, marine debris, entanglement, collisions and vessel traffic. Whales have been recognized for the ecosystem services they provide: they enhance primary productivity, supply nutrients and habitat for deep-sea species, provide climate regulation, and remain a food resource for some communities. Whales also provide society of cultural and conservation values. Management and research programs provide seasonal industries in many communities while a global whale watching industry is valued at nearly two billion dollars per year. Experiencing whale watching can have a positive influence in human subjective well-being while it results in welfare and conservation benefits for the whales, but the opposite may also happen since exposure to vessel harassment can impact negatively in whale welfare. At the same time, human well-being can indirectly influence biodiversity through changes in institution and governance systems, but the way it does may depend on the socio-economic context of a society. Economic growth, which many claims is necessary for achieving human well-being, would inevitably lead to biodiversity loss via a set of mechanisms triggered by increased resource use. This, however, would ultimately diminish human well-being as most ecosystem services are not fully replaceable or irreplaceable. Rebuilding marine life could be achieved if major pressures are mitigated, and whales could be key allies due to their value in both ecosystems and societies. The ecological, economic and social gains of doing it would be far-reach than the costs; and this may be the only way to promote both whale welfare and human well-being in the long term.

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