Publishing Information

**Title of the Series:** ICAR Technical Series

**Title of the Issue:** ICAR Claw Health Atlas

**Editors:** ICAR Working Group on Functional Traits (ICAR WGFT) and International Claw Health Experts (see page 6-7)

**Coordination of work:** Christa Egger-Danner

**Responsible for harmonized descriptions / Citation of the ICAR Claw Health Atlas:**


**Layout and design:** Franziska Egger, Hollenstein, Austria

**Editing of text and pictures:** John Cole, USA and Johann Kofler, Austria

**Publisher:** ICAR, Via Savoia 78, Scala A, Int. 3, 00191, Rome, Italy; Tel: +39 06 85 237 1; Email: icar@icar.org

**Copyright by:** ICAR, Via Savoia 78, Scala A, Int. 3, 00191, Rome, Italy

**ISSN:** 92-95014-14-6

**ISBN:** 92-95014-18

**Edition:** Second edition, January 2020
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>4</td>
</tr>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>Authors and Contributors</td>
<td>6</td>
</tr>
<tr>
<td>Overview of Foot and Claw Disorders</td>
<td>9</td>
</tr>
<tr>
<td>List of Pictures</td>
<td>44</td>
</tr>
</tbody>
</table>
ICAR is an international organisation with the mission of promoting the development and improvement of performance recording and genetic evaluation of farm livestock. Our members are animal recording organisations from around the world and associates who provide services to the animal recording industry. Our eighteen technical Groups, each of which focuses on specific aspects of animal recording or genetic evaluation, carry out much of our work. The work of our Groups generally covers: standards & guidelines, communications, surveys, and innovation. Their output is available from the ICAR website (http://www.icar.org/) and is reported at the annual ICAR meetings. ICAR is particularly appreciative of the large amount of work undertaken by the experts who provide their time and knowledge, free of charge, to develop international standards and guidelines for animal recording. As a consequence of this work, the information available from ICAR's members around the world is being used to help farmers make decisions leading to a more efficient animal production sector worldwide.

The ICAR Functional Traits Working Group (ICAR WGFT) is particularly active and has focused on a range of very important traits in dairy cattle including: fertility, udder health, and, most recently, feet and legs. This work is part of ICAR's strategy for helping its members to provide better services to farmers and to facilitate the genetic improvement of farmed livestock, particularly dairy cattle. For the first time we now have an international Atlas and coding system for claw traits in dairy cattle. This represents a major step forward in ensuring the incidence of claw defects affecting animal health, welfare, and productivity can be reduced in the future.

ICAR is focused on continuous improvement and welcomes all feedback on how it can improve its services and in particular the quality of its standards and guidelines.

Hans Wilmink
ICAR President
Introduction

Awareness of the importance of a properly functioning locomotor system to bovine health and welfare has increased around the world. Several countries have recently introduced electronic systems to routinely record foot and claw disorders in dairy cattle and many more countries are developing plans or have committed to begin recording in the near future. This motivated the ICAR working group for functional traits to prioritize foot and claw health and to work with internationally recognized claw experts to develop best practices for data recording. This collaboration is intended to complement existing research on specific aspects of the claws and feet of dairy cattle, focusing solely on the standardization and harmonization of data recording. The harmonized descriptions are the result of fruitful interdisciplinary collaboration among many experts with varying backgrounds (claw health experts, hoof trimmers, bovine practitioners, geneticists), ensuring comprehensive coverage of theoretical and applied needs. It is designed to provide a tool for practitioners and hoof trimmers and presents guidelines for the recording of important conditions affecting the claw health of cattle. Descriptive trait definitions are used to ensure that accurate classifications are made, which will support the collection of comparable and high-quality data within and across countries to support many activities (e.g., genetic evaluation purposes). The authors and contributors to the ICAR Claw Health Atlas hope that the compiled material will support the improved recording of foot and claw disorders and provide a valuable tool for improving the health and welfare of dairy cattle.

The authors and contributors of the ICAR Claw Health Atlas

© Nielsen, DK
Authors and Contributors

**Austria**  
Johann Burgstaller, University Clinic for Ruminants, University of Veterinary Medicine, Vienna  
Christa Egger-Danner, ZuchtData EDV-Dienstleistungen GmbH, Vienna  
Johann Kofler, University Clinic for Ruminants, University of Veterinary Medicine, Vienna  
Robert Pesenhofer, Federation of Austrian Hoof Trimmers, Hitzendorf

**Australia**  
Jakob Malmo, Maffra Veterinary Centre, Maffra  
Erika Oakes, Dairy Australia, Southbank, Victoria  
Jennie Pryce, Department of Environment and Primary Industries and La Trobe University, Agribio, Bundoora, Victoria

**Belgium**  
Nicolas Gengler, Université de Liège - Gembloux Agro-Bio Tech, Gembloux

**Canada**  
Anne-Marie Christen, Valacta, Québec  
Victor Daniel, Vic’s Custom Clips est. 1984, Quality Bovine Hoof Care, Ontario  
Paul R. Greenough, Professor Emeritus of Veterinary Surgery, University of Saskatchewan

Filippo Miglior, Canadian Dairy Network and University of Guelph, Ontario  
Francesca Malchiodi, University of Guelph, Ontario

**Denmark**  
Nynne Capion, Department of Large Animal Sciences, University of Copenhagen, Copenhagen  
Pia Nielsen, SEGES P/S, Aarhus

**Germany**  
Andrea Fiedler, bovine practitioner / Association of Certified Hoof Trimmers (VgK e.V.), Munich  
Kerstin Müller, Veterinary Medicine Faculty, Freie Universität, Berlin  
Kathrin Friederike Stock, vit - Vereinigte Informationssysteme Tierhaltung w.V., Verden

**Finland**  
Reijo Junni, Environmental Health Office of Central Ostrobothnia, Kokkola  
Elina Paakala, Faba co-op, Vantaa

**France**  
Joël Blanchard, Hoof trimmers training team at CFPPA, Le Rheu  
Marc Delacroix, Veterinarian, member of training team at CFFPA, Le Rheu
Authors and Contributors

Jean Prodhomme, Hoof trimmers training team at CFPPA, Le Rheu
Gilles Thomas, Institut de l’Élevage, Paris
Ireland
Keelin O’Driscoll, Teagasc, Moorepark, Cork
The Netherlands
Menno Holzhauser, GD Animal Health, Deventer
Gerben de Jong, CRV, Arnhem
New Zealand
Anna Irwin, DairyNZ, Invercargill
Norway
Terje Fjeldaa, Norwegian University of Life Sciences, Oslo
Bjørg Heringstad, Norwegian University of Life Sciences / Geno, Ås
Cecilie Ødegard, Geno, Ås
Maren Knappe-Poindecker, Norwegian University of Life Sciences, Oslo
Åse Margrethe Sogstad, TINE, Ås
Spain
Noureddine Charfeddine, Conafe, Madrid
Adrián González Sagüés, Anka Hoof Care, Orkoien, Navarra
Pedro Codesido, Seragro, S. Coop. Galega, A Coruña
Switzerland
Adrian Steiner, University of Bern, Vetsuisse Faculty, Bern
Sweden
Christer Bergsten, Swedish University of Agricultural Sciences, Alnarp
Karin Ulvshammar, Växa Sverige, Stockholm
United Kingdom
Andrew J Bradley, Quality Milk Management Services Ltd, Somerset
Jonathan Clarke, SKS Foot trimming Services Ltd, Seaford, East Sussex
Michael Parkinson, Holstein UK, Herts
Becky Whay, University of Bristol, School of Veterinary Sciences Langford, Bristol
United States of America
John Cole, Animal Genomics and Improvement Laboratory, ARS, USDA, Beltsville
Dörte Döpfer, Food Animal Production Medicine, School of Veterinary Medicine, University of Wisconsin in Madison, Madison
Gerard Cramer, College of Veterinary Medicine, University of Minnesota, St. Paul
## Overview of Foot and Claw Disorders

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Description</th>
<th>Synonymous Terms</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetric claws</td>
<td>AC</td>
<td>Significant difference in width, height and/or length between outer and inner claw which cannot be balanced by trimming</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Concave dorsal wall</td>
<td>CD</td>
<td>Concave shape of the dorsal wall</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Corkscrew claws</td>
<td>CC</td>
<td>Any torsion of either the outer or inner claw. The dorsal edge of the wall deviates from a straight line</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Digital dermatitis</td>
<td>DD</td>
<td>Infection of the digital and/or interdigital skin with erosion, mostly painful ulcerations and/or chronic hyperkeratosis/proliferation</td>
<td>Mortellaro disease, Strawberry disease</td>
<td>15</td>
</tr>
<tr>
<td>Interdigital/superficial dermatitis</td>
<td>ID</td>
<td>All kind of mild dermatitis around the claws, that is not classified as digital dermatitis</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Double sole</td>
<td>DS</td>
<td>Two or more layers of under-run sole horn</td>
<td>Underrun sole</td>
<td>19</td>
</tr>
<tr>
<td>Heel horn erosion</td>
<td>HHE</td>
<td>Erosion of the bulbs, in severe cases typically V-shaped, possibly extending to the corium</td>
<td>Slurry heel, Erosio ungulae</td>
<td>21</td>
</tr>
<tr>
<td>Horn fissure</td>
<td>HF</td>
<td>Crack in the claw wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axial horn fissure</td>
<td>HFA</td>
<td>Vertical (longitudinal) crack in the inner claw wall</td>
<td></td>
<td>23</td>
</tr>
</tbody>
</table>
# Overview of Foot and Claw Disorders

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Description</th>
<th>Synonymous Terms</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal horn fissure</td>
<td>HFH</td>
<td>Horizontal crack in the claw wall</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Vertical horn fissure</td>
<td>HFV</td>
<td>Vertical (longitudinal) crack in the outer or dorsal claw wall</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td><strong>Interdigital hyperplasia</strong></td>
<td>IH</td>
<td>Interdigital growth of fibrous tissue</td>
<td>Corns, Tyloma, Interdigital fibroma</td>
<td>26</td>
</tr>
<tr>
<td><strong>Interdigital phlegmon</strong></td>
<td>IP</td>
<td>Symmetric painful swelling of the foot commonly accompanied with odorous smell with sudden onset of lameness</td>
<td>Foot rot, Foul in the foot, Interdigital necrobacillosis</td>
<td>28</td>
</tr>
<tr>
<td>Scissor claws</td>
<td>SC</td>
<td>Tip of toes crossing each other</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>Sole hemorrhage</strong></td>
<td>SH</td>
<td>Diffused and/or circumscribed red or yellow discoloration of the sole and/or white line</td>
<td>Sole bruising</td>
<td></td>
</tr>
<tr>
<td>Sole hemorrhage diffused form</td>
<td>SHD</td>
<td>Diffused light red to yellowish discoloration</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Sole hemorrhage circumscribed form</td>
<td>SHC</td>
<td>Clear differentiation between discolored and normal colored horn</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

*Note: Table entries and their descriptions are based on common veterinary terminology.*
# Overview of Foot and Claw Disorders

<table>
<thead>
<tr>
<th>Name</th>
<th>Code</th>
<th>Description</th>
<th>Synonymous Terms</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swelling of coronet and/or bulb</td>
<td>SW</td>
<td>Uni- or bilateral swelling of tissue above horn capsule, which may be caused by different conditions</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>Ulcer</td>
<td>U</td>
<td>Ulceration of the sole area specified according to localization (zones) such as bulb ulcer, sole ulcer, toe ulcer, toe necrosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sole ulcer</td>
<td>SU</td>
<td>Penetration through the sole horn exposing fresh or necrotic corium</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Bulb ulcer</td>
<td>BU</td>
<td>Ulcer located at the bulb</td>
<td>Heel ulcer</td>
<td>36</td>
</tr>
<tr>
<td>Toe ulcer</td>
<td>TU</td>
<td>Ulcer located at the toe</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>Toe necrosis</td>
<td>TN</td>
<td>Necrosis of the tip of the toe with involvement of bone tissue</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Thin sole</td>
<td>TS</td>
<td>Sole horn yields (feels spongy) when finger pressure is applied</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>White line disease</td>
<td>WL</td>
<td>Separation of the white line with or without purulent exudation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White line fissure</td>
<td>WLF</td>
<td>Separation of the white line which remains after balancing both soles</td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>White line abscess</td>
<td>WLA</td>
<td>Necro-purulent inflammation of the corium</td>
<td></td>
<td>42</td>
</tr>
</tbody>
</table>
Asymmetric claws (AC)

Significant difference in width, height and/or length between outer and inner claw which cannot be balanced by trimming
Concave dorsal wall (CD)

Concave shape of the dorsal wall

© Fiedler, GER

© Thomas, FRA
Corkscrew claw (CC)

Any torsion of either the outer or inner claw. The dorsal edge of the wall deviates from a straight line.
Digital dermatitis (DD)

Infection of the digital and/or interdigital skin with erosion, mostly painful ulcerations and/or chronic hyperkeratosis/proliferation

© Müller, GER

© Kofler, AUT
Digital dermatitis (DD)

Infection of the digital and/or interdigital skin with erosion, mostly painful ulcerations and/or chronic hyperkeratosis/proliferation
Digital dermatitis (DD)

Infection of the digital and/or interdigital skin with erosion, mostly painful ulcerations and/or chronic hyperkeratosis/proliferation

© Fiedler, GER
© Kofler, AUT
**Interdigital/ superficial dermatitis (ID)**

All kind of mild dermatitis around the claws, that is not classified as digital dermatitis.
Double sole (DS)

Two or more layers of under-run sole horn

© Bergsten, SWE

© Kofler, AUT
Double sole (DS)

Two or more layers of under-run sole horn

© Fjeldaas, NOR

© Fiedler, GER
Heel horn erosion (HHE)

Erosion of the bulbs, in severe cases typically V-shaped, possibly extending to the corium

© Müller, GER

© Clarke, UK
Heel horn erosion (HHE)

Erosion of the bulbs, in severe cases typically V-shaped, possibly extending to the corium
Axial horn fissure (HFA)

Vertical (longitudinal) crack in the inner claw wall

© Malmo, AUS

© Kofler, AUT
Horizontal horn fissure (HFH)

Horizontal crack in the claw wall
Vertical horn fissure (HFV)

Vertical (longitudinal) crack in the outer or dorsal claw wall

© Kofler, AUT

© Bergsten, SWE
Interdigital hyperplasia (IH)

Interdigital growth of fibrous tissue

© Kofler, AUT

© Kofler, AUT
Interdigital hyperplasia (IH)

Interdigital growth of fibrous tissue

© Kofler, AUT

© Jaroch, POL
Interdigital phlegmon (IP)

Symmetric painful swelling of the foot commonly accompanied with odorous smell with sudden onset of lameness
Interdigital phlegmon (IP)
Symmetric painful swelling of the foot commonly accompanied with odorous smell with sudden onset of lameness
Scissor claws (SC)
Tip of toes crossing each other

© Bergsten, SWE
© Kofler, AUT
Sole hemorrhage diffused (SHD)

Diffused light red to yellowish discoloration

© Fiedler, GER

© Prodhomme, FRA
Sole hemorrhage circumscribed (SHC)

Clear differentiation between discolored and normal colored horn
Swelling of coronet and/or bulb (SW)

Uni- or bilateral swelling of tissue above horn capsule, which may be caused by different conditions
Swelling of coronet and/or bulb (SW)

Uni- or bilateral swelling of tissue above horn capsule, which may be caused by different conditions

© Kofler, AUT
Sole ulcer (SU)

Penetration through the sole horn exposing fresh or necrotic corium

© Delacroix, FRA

© Thomas & Prodhomme, FRA
Bulb ulcer (BU)

Ulcer located on the bulb
Toe ulcer (TU)

Ulcer located at the toe

© Fjeldaas, NOR

© Kofler, AUT
Toe necrosis (TN)

Necrosis of the tip of the toe with involvement of bone tissue

© Clarke, UK

© Kofler, AUT
Toe necrosis (TN)

Necrosis of the tip of the toe with involvement of bone tissue
Thin sole (TS)

Sole horn yields (feels spongy) when finger pressure is applied
White line fissure (WLF)

Separation of the white line which remains after balancing both soles
White line abscess (WLA)

Necro-purulent inflammation of the corium

© Kofler, AUT

© Fjeldaas, NOR
White line abscess (WLA)

Necro-purulent inflammation of the corium

© Kofler, AUT
List of Pictures

**Bergsten, Christer (SWE):** DS P19a; HFV P25b; SC P30a;

**Blanchard, Joël (FRA):** SHC P32a;

**Capion, Nynne (DK):** AC P12b; BU P36b;

**Christen, Anne-Marie (CAN):** DD P16a;

**Clarke, Jonathan (UK):** HHE P21b; TN P38a;

**Daniel, Victor (CAN):** Trimming P8;

**Delacroix, Marc (FRA):** SU P35a; TN P39a,b;

**Greenough, Paul (CAN):** HFH P24a,b;

**Hausegger, Otto (AUT):** Cover picture;

**Fiedler, Andrea (GER):** AC P12a; CD P13a; DD P17a; ID 18b; DS 20b; IP P28a; SHD P31a; TS P40a; Trimming P45;

**Fjeldaas, Terje (NOR):** DS P20a; TU P37a; WLA P42b;

**Jaroch (POL):** IH P27b;

**Junni, Reijo (FIN):** IP P29b;
List of Pictures

Knappe-Poindecker, Maren (NOR): ID P18a;
Kofler, Johann (AUT): CC P14a,b; DD P15b; DD 17b; DS P19b; HHE P22b; HFA 23b; HFV P25a; IH P26a,b; IH P27a; IP P28b; SC P30b; SHC P32b; SW P33a,b; SW P34a,b; BU P36a; TU P37b; TN P38b; TS P40b; WLF P41a; WLA P42a; WLA P43a,b;
Malmo, Jakob (AUS): HFA P23a;
Müller, Kerstin (GER): DD P15a; HHE P21a; HHE P22a; IP P29a;
Nielsen, Pia (DK): Trimming P5; WLF P41b;
Pesenhofener, Robert (AUT): Trimming P3;
Prodhomme, Jean (FRA): SHD 31b; SU P35b;
Thomas, Gilles (FRA): CD P13b; DD P16b; SU P35b;